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Moosac Tunnel

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Hoosac Tunnel; brief report of
hearing of the Troy & Greenfield
railroad petitioners. 1853.

Hoosac Tunnel & Troy
& Greenfield railroad, 1862.

Theseus, pseud. Death of our Modern Minotaur, 1868.

SENATE.....No. 49.

[Reported by a Special Joint Committee, consisting of Messrs. HUBBARD and BATES of the Senate, and LINCOLN, of Hingham, GILES, of Cambridge, STEVENSON, of Boston, CHAMBERLIN, of Dalton, and AVERY, of Marblehead, of the House.]

Commonwealth of Massachusetts.

IN SENATE, March 8, 1841.

The Committee to whom was referred the petition of Robert F. Barnard and others, in behalf of himself as President of the Berkshire Rail-road Corporation, and also in behalf of certain stockholders in said corporation, beg leave to submit the following

REPORT.

Before we proceed to the consideration of the reasons, which have induced us to submit the annexed bill, we beg leave to refer to the facts which exist in regard to the application.

The act incorporating "the Berkshire Rail-road Company," was passed April 13, 1837. It authorized the company to construct a rail-road from the south line of the Commonwealth,

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in the town of Sheffield, near Ashley's mills, through the towns of Sheffield, Great Barrington, and the village of Vandeusenville, to its intersection with the Western Rail-road, or the West Stockbridge Rail-road, in the village of West Stockbridge.

At the time of the passage of the act, that portion of the Western Rail-road, which lies in that part of the county of Berkshire, was not located; but, it was supposed that it would probably be so located, as to pass over the line of the location of the Berkshire road, for a part of its course; and the act, therefore, contains a provision, that the Western Rail-road should have the right to assume such portions of said road as they should choose to occupy, upon certain terms and conditions mentioned therein. But, the Western Rail-road, having been located through the village of Pittsfield, and through a more northerly part of the town of West Stockbridge than was at first contemplated, it became necessary for the Berkshire company to connect with the Western Rail-road at a point, westerly from the village of West Stockbridge, and near to the line of the State of New York; thereby increasing, to a small extent, the length of the Berkshire road, and making the whole distance of it a little less than twenty-one miles.

The object of the petitioners for the original act of incorporation, was to connect the Western Rail-road with the northern terminus of the Housatonic Rail-road, extending from the south line of the State, in the town of Sheffield, to the city of Bridgeport, in Connecticut.

This latter road is about seventy-five miles in length, of which the south part, from the town of New Milford to Bridgeport, is now in successful operation, a distance of thirty-five miles; and, upon the remaining portion, of about forty miles, there are a large body of men engaged in hastening its completion. The whole of it is now under contract; and it is expected, with what appears to be sufficient reason, that it will be finished by the first day of December next. Should then this expectation be realized, and should the Berkshire road be

completed, the completion of the road from the line of the State of New York to Albany will open a line of rail-road intercommunication from the eastern terminus of the Erie canal, through the States of Massachusetts and Connecticut, to the sound.

The stock of the Berkshire Rail-road has been divided into two thousand five hundred shares, of one hundred dollars each, amounting, in the whole, to the sum of two hundred and fifty thousand dollars.

The road has been located and estimated, and the last-mentioned sum is the estimated expense for the construction of the road. In fact, the officers of the corporation have now the offer of an intelligent and a substantial man to finish the work for that sum, and to receive as part payment therefor, the amount of seventy thousand dollars in the capital stock of said corporation. This offer, on the part of an experienced and scientific contractor, we regard not only as strong evidence of the correctness of the estimates, but also as the unbiassed opinion of a competent person, as to the value both of the stock, and the advantages of the road.

But little effort has as yet been made by the corporation to complete the subscription to the stock, and it is proper to state the reason why the business has thus lingered from the day of the act of incorporation to the present time.

It will be seen, by a reference to the map, that the Berkshire Rail-road is only a link, connecting the Western Rail-road with the road passing down the valley of the Housatonic, and that, without the completion of one of these roads, it would be of no value. At the time of the passage of the act, preparations were being made for an immediate completion of the road from the south termination of the Berkshire road to tide water; and it was the expectation of the friends of both these public works, that they should be completed at the same time. Difficulties, however, intervened, which suspended the operations of the Housatonic company upon the northern portions of their road; and of course this delay suspended the exertions of the Berk-

shire company. But the recent completion of that part of the Housatonic road, which lies between New Milford and Bridgeport, and the success which has seemed to attend the enterprise, have stimulated the stockholders of that company to complete the remaining portion from New Milford to the State line. The prospect of its completion at the time already mentioned has awakened the attention of the people in the western portion of this State; and they have attempted, though as yet ineffectually, to obtain a subscription to a full amount of the stock. That this attempt has not been successful, might seem at first to argue a want of confidence in the community in the advantages of the road, and in the value of the stock. But it will be recollected, that the road is not of a character to engage the attention of the capitalists in our large cities, inasmuch as its success does not tend, in a great degree, to enhance the value of the real estate in the cities to which they respectively belong; and experience has shown that these persons are influenced to subscriptions of stock not only by its intrinsic value, but by considerations resulting to them from its general effect upon their estates and upon their business.

It will also be considered that the road passes through a portion of our Commonwealth, which contains few if any capitalists. The people of Berkshire county are chiefly engaged in agriculture and manufactures. The former have little money to invest, and the latter require all the funds derivable from their business to carry on their own operations. The abstracts of our bank returns show how little even of bank stock is owned in that county, and when we consider that its inhabitants are comparatively unused to the hazardous operations of trade, it is hardly to be expected that even their wealthy men will give up the security of a bond and mortgage to engage in an undertaking so foreign to their usual pursuits.

But in view of the prospective advantages from the completion of this road, it seems to be evident that, if the loan can be obtained from the State, the stock will be subscribed and the road will be made. At any rate, we have endeavored, in the

act which is herewith reported to guard against any improvident action in this respect, or any further calls for legislative aid, by the evidence required of the actual expenditure of money previously to the payment of any instalment, by giving a majority of the directors to the State, and by the provision that the one half of the loan which is prayed for by the petitioners shall be paid only after the road shall have been put in a situation for the passage of the engines and cars.

The conclusion to which we have arrived, recommendatory of a compliance with the prayer of the petitioners, in extending the aid of the State to expedite the construction of this rail-road, has not been concurred in without a particular examination of the evidence, as to the security of the loan, and the usefulness of the road. Upon both these points the evidence presented to us has been full; and, as to the first point, we have endeavored so to frame the bill annexed, as to remove all apprehension of danger of a loss to be sustained by the State.

As has already been stated, the length of the road is a little less than twenty-one miles. The road is located along the valley of the Housatonic; and, for the greater part of the distance, the line is almost a straight one, requiring but little embankment or excavation. The country through which it passes is remarkably level; and the evidence was before the committee, that for the distance of thirteen miles along its course, there is a fall of only thirteen feet in the water of the stream along which it passes. The remaining distance is more uneven and irregular; though, in no case, is there an elevation of more than twenty-five feet to the mile. In fact, the estimated expense of building the road, (being only about twelve thousand dollars to the mile,) shows in a great measure the extraordinary facility and cheapness with which it can be constructed.

In regard to the second point, there was no discordance of opinion among the numerous witnesses examined by the committee; and the belief is entertained, that the construction of this road will be a greater benefit to the county of Berkshire,

than even the construction of the Western Rail-road itself. The reasons for this belief are apparent, when we consider the resources of that fertile county, and its situation with regard to the great natural and artificial modes of communication with the great markets of our country. The natural course of trade, for the whole county of Berkshire, is undoubtedly towards New York. That city has been the mart for the sale of its manufactures; and in that city, for the most part, have its inhabitants procured the raw material, to supply their manufacturing establishments. Previous to the construction of the Housatonic Rail-road, from Bridgeport as far north as New Milford, the means of communication was by the way of the Hudson river, the average distance of the cities of Hudson and Albany being about twenty-five miles from their places of business.

But, when the navigation of this stream was interrupted, goods were transported to New Haven or to Bridgeport, a distance of from seventy-five to one hundred and twenty-five miles. Since the completion, however, of that part of the road, the transportation of articles has been carried on between New Milford and the various manufactures of Berkshire, during the winter season, and when that road shall be extended as far north as the state line, in Sheffield, it is reasonably to be expected that the greater part of the business between that county and New York, both in winter and summer, will pass over it.

The amount of transportation upon it, will almost necessarily be very great. Berkshire county possesses an amount of natural resources which is exceeded, perhaps, by no one county in the State. Her inexhaustible mines of iron ore, her immense quarries of marble, aside from the transportation incident to her manufacturing and agricultural industry, must of themselves furnish it with no inconsiderable amount of transportation; and when, by the construction of this rail-road, these great natural resources shall be more fully developed, they will afford a constantly increasing profit, not only to the road itself, but also to the county. Even without the advantage of rail-

road transportation, the commerce in these products of her hills has been somewhat extensive. The material for that beautiful structure, the city hall, in the city of New York, was obtained from her quarries; and within the three last years contracts to the amount of five hundred thousand dollars have been made, for the transportation and delivery of those heavy blocks of marble which are to form the magnificent colonnade of the Girard College, in the city of Philadelphia.

If, during the time this transportation has continued, the road had been in operation, this great amount of freight would have passed over it; and when we consider the expense attending its transportation to the Hudson, its distance from its native bed to its ultimate destination, and the inexhaustible supply which yet remains even in the very quarry from which it was taken, it is difficult to estimate the quantity which will be required for future uses, when the facilities of a rail-road shall, in effect, have placed these extensive quarries upon the banks of the Hudson.

It is also true that the marble which is used in the counties bordering upon the Connecticut river, is chiefly obtained from the quarries of Berkshire, and the transportation of lime from that county to the Connecticut river valley is an extensive business, which has been carried on for years. A great amount both of the lime and marble destined for this market would pass over this road, and the transportation would be profitable not only to this but also to the Western Rail-road.

We have already alluded to the amount of the iron ore which exists in the hills of Berkshire, and to the profit to be expected from its transportation upon this road. But there is besides, a vast amount of profit to be expected from the transportation of iron ore and of manufactured iron from the mines, and from the manufactories in Connecticut. The ore in Salisbury, in that State, is said to be of the very best quality, and large quantities, both of the ore and of the iron, are annually transported from that place to Massachusetts,—the former to be manufactured by our own laborers, and the latter for the uses of our artisans.

Without pursuing this subject to a more tedious extent, we will advert to another reason why the road should be completed as soon as circumstances will admit.

No one, surely, can be insensible to the advantages which the completion of the Western Rail-road is to extend to the Commonwealth of Massachusetts, and particularly to the city of Boston. Nor can any one resist the conclusion, that it will produce a correspondingly injurious effect upon the city of New York. If then we attribute to the inhabitants of the latter city, the possession of an enlarged and liberal view of the measures necessary to be adopted for the promotion of their own interests, we shall naturally conclude that they will speedily adopt a system of measures to counteract the influences which this diversion of their trade will exert upon their prosperity. In other words, we must suppose that they will construct a rail-road from Albany to New York for the accommodation of their business while their river is closed. There are two general routes along which this line of intercommunication must run. One of them lies wholly in the State of New York, along the eastern bank of the Hudson; the other is the chain of rail-roads and navigation, of which the Berkshire road is but a single link. To construct the former must be a work of years. Its cost must swell into millions. To construct the latter is comparatively but the work of a day. The completion of a road of less than twenty-one miles, completes the means of intercommunication between those cities. If it shall not speedily be completed, the other road assuredly will be. But if this can be finished in a reasonable time, the motive to exertion, on the part of those interested, will in some measure cease, and if it does not defeat it will at least delay it; and when we consider the advantages resulting from the flow of business through a portion of our own territory, and the increase which this business will give to a portion of the Western Rail-road over which it must pass, we see a strong reason for the expression of a wish that these objects may be accomplished.

The question may perhaps be started, what will be the effect of the construction of this road upon the success of the Western Rail-road, or upon the commercial interests of the capital city of our State? We reply that this question was met and answered at the time of the passage of the act incorporating the petitioners. Then was the proper time to see, that in giving them liberty to tap this great work, in which the State has so deep an interest, the general interests of all the people of the State should receive no detriment; and there exists strong reasons for the belief, that in granting the act of incorporation, the legislature were influenced by a high and enlightened regard for all those general interests.

But we are far from assenting to the opinion, that the construction of the Berkshire road will be an injury to either of the two interests alluded to. It will not be denied, that it will have a tendency to direct the course of trade to the city of New York, which, without a similar mode of transportation, would otherwise flow on to Boston. But even then, if the road from Albany to New York is not built, that trade will pass over the western portion of the Western Rail-road, and when at the angle of divergence of the two roads leading respectively to each of those cities, and at a distance about equal from them, there would be no motive for a merchant to select one or the other of these markets, except the advantages arising to him from considerations of price. Upon this subject, the merchants of Boston must expect competition, and they ought to expect it; and if, with an equality of privileges in the mode of communication with the business of the west, they are not disposed to hold out an equality of inducements to the western merchants, they ought not to expect but that the more liberal spirit of other cities will be successful.

But we have no fears for the interests of Boston in this respect. Her means of communicating with the west will soon be complete. The funds of the Commonwealth have been freely expended in the prosecution of this great work; and with the means of thus promoting her own prosperity, by her

own industry, we trust she will be satisfied with the possession of "a fair field, and no favor."

The provision which has thus been made for her benefit, as also for the benefit of the more rich and densely populated portions of the State, is a reason why the county of Berkshire should receive a favorable attention, at least, to the consideration of this, her first call upon the assistance of the Commonwealth. Shut out, as she is, by a lofty range of mountains, from her sister counties, her trade naturally flowing into the channels of other states, there is little except her legislative connexion which binds her to us as a portion of our territory. It is true that the construction of the Western Rail-road will tend to the consolidation of our interests, and will bring her into an immediate connexion, in feeling and in interests, with the eastern part of our State. But the Western Rail-road, it will be recollected, passes through comparatively an unfruitful portion of her territory. Her great resources lie both to the south and to the north of this great work; and when it is considered that her southern border is approached by a road which will draw off towards New York the business of that portion of her county, we are impelled, as well by a regard to her own peculiar interests as to those of the State at large, to recommend the adoption of a measure so well calculated to promote all these objects.

Per order.

WM. G. BATES.

Commonwealth of Massachusetts.

In the year One Thousand Eight Hundred and Forty-one.

AN ACT

To aid the construction of the Berkshire Rail-road.

BE *it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same, as follows:*

SEC. 1. The treasurer of this Commonwealth is hereby authorized and directed, to issue scrip or certificates of debt in the name and behalf of said Commonwealth, for the sum of one hundred thousand dollars, bearing an interest of five per centum per annum, payable semi-annually, at the office of said treasurer, and redeemable at the same place, at the expiration of twenty years from the first day of April next: which scrip or certificates shall be deemed a pledge of the faith and credit of the Commonwealth for the redemption thereof: and the said treasurer shall deliver said scrip or certificates of debt to the treasurer of the Berkshire Rail-road corporation for the purpose of enabling the said corporation to construct their rail-road at such times and under such conditions, as are hereafter provided.

SEC. 2. When the sum of two hundred and fifty thousand dollars shall have been subscribed to the capital stock of said corporation, and when the said corporation shall have proved to the satisfaction of the governor and council, either by the report of some skilful engineer, to be appointed for that purpose by the governor and council, at the expense of said corporation, or otherwise, that the sum of seventy-five thousand dollars has been expended (in work) in the construction of said road, the treasurer of said Commonwealth shall deliver to the treasurer of said corporation, scrip or certificates issued as aforesaid, to the amount of twenty-five thousand dollars. And when said corporation shall further satisfy the governor and council in manner aforesaid, that they have expended the farther sum of seventy-five thousand dollars in the construction of their said road, the treasurer of this Commonwealth shall deliver to the treasurer of said corporation, scrip or certificates, issued as aforesaid, for the further sum of twenty-five thousand dollars. And when said corporation shall have satisfied the governor and council in manner aforesaid, that they have expended the further sum of one hundred thousand dollars in the construction of said road, and shall have fully completed the same, in readiness for the passage of engines and cars over the entire length of the same, and shall have erected all necessary and suitable depots and buildings for the necessary uses of said road, the treasurer of said Commonwealth shall deliver to the treasurer of said corporation, scrip or certificates, issued as aforesaid, for the further sum of fifty thousand dollars.

SEC. 3. This act shall not take effect until said

corporation at a meeting of the stockholders duly notified for that purpose, shall have assented to all the provisions thereof, and shall have executed to the Commonwealth, a bond in such form as the attorney general shall prescribe, conditioned that said corporation shall indemnify and save harmless the Commonwealth from all liability on account of said scrip or certificates, and shall pay the interest thereon punctually, as the sum shall fall due, at the office of the treasurer of the Commonwealth, until the several sum or sums thereof shall be paid by said company; and shall pay at the office of said treasurer of the Commonwealth the principal sum or sums aforesaid, one year before the same shall become redeemable by the Commonwealth. And shall also convey by a suitable instrument to be prepared for the purpose, under the direction of the attorney general, their entire road and its income, and all the property and franchise of said company, as a pledge or mortgage to secure the performance of all the conditions of said bond.

SEC. 4. The directors of said corporation shall be in number, of whom may be chosen by said corporation and shall be appointed by the governor, by and with the consent of the council.

THE

HOOSAC TUNNEL.

A BRIEF

REPORT OF THE HEARING

OF THE

TROY AND GREENFIELD RAILROAD COMPANY PETITIONERS

FOR

A LOAN OF TWO MILLIONS,

BEFORE

A JOINT SPECIAL COMMITTEE OF THE LEGISLATURE
OF MASSACHUSETTS.

BOSTON:
THURSTON, TORRY, AND EMERSON, PRINTERS.
1853.

JOINT SPECIAL COMMITTEE.

SENATE.

Messrs. Clark,	Roxbury,	Norfolk	County.
Davenport,	Hopkinton,	Middlesex	"
Brewster,	Boston,	Suffolk	"
Crocker,	Yarmouth,	Barnstable	"
Loud,	Weymouth,	Norfolk	"
Prouty,	Scituate,	Plymouth	"

HOUSE.

Messrs. Richmond,	Adams.
Kellogg,	Hadley.
Marcy,	Southbridge.
Crosby,	Lowell.
Brainard,	Haverhill.
Brown,	Salem.
Holbrook,	Boston.
Livermore,	Cambridge.
Duncklee,	Brighton.
Daggett,	Attleborough.
Sproat,	Wareham.

PROCEEDINGS BEFORE COMMITTEE.

The Committee met in the Senate Chamber, February 9th, 1853. The Petitioners were represented by E. H. Derby, and J. M. Keith, Esquires, as Counsel. The Western Railroad Corporation, who appeared as Remonstrants, were represented by Ansel Phelps, Esq., Counsel. R. Colby, Esq. appeared for some of the Petitioners in aid of the main Petition.

Mr. Phelps stated the remonstrance of the Western Railroad Company would be ready next week for presentation.

Mr. Keith opened the case by reading the Charter of the Petitioners, granted May 10, 1848, authorizing them to construct a railroad from the terminus of the Vermont and Massachusetts Railroad, at or near Greenfield, through the valleys of the Deerfield and Hoosac, to the State line, there to unite with a railroad leading to the city of Troy. The Capital Stock authorized was $3,500,000.

Mr. Keith stated also that the location had been duly filed and the construction commenced. He then read the Petition of the Troy and Greenfield Railroad Company, requesting a loan of the State scrip on mortgage, and stating,

First. That the State had lent its aid to the Western Railroad, and other similar enterprises.

Second. That the chief inducement of the State for the liberal aid given to the Western Railroad, was the expectation that it would furnish a cheap transit for the produce of the West, which it had failed to afford by reason of its steep grades, elevated summits, short curves, and high cost of construction ; a failure illustrated by the fact, that there had been a regular diminution on the through freight between Albany and Boston, since 1847, when it reached its maximum. The through freight having fallen from 100,400 tons in 1847, to 60,788, in 1851, although the western freight reaching the Hudson River, had rapidly increased in the interval.

Third. That the Troy and Greenfield Railroad will greatly reduce grades, summit, curvature, and distance.

Fourth. The memorialists conclude as follows : — The completion of the Troy and Greenfield Railroad will vastly increase the productive business activity, and immensely enlarge the resources of Massachusetts, aside from the local traffic that is sure to follow through the entire extent of the road. The grades will be less, the distance shortened, and the whole cost $4,000,000 less than the Western Railroad. These advantages will afford a corresponding tariff. The increase of avenues avail nothing to the Capital of Massachusetts, while the charges continue, as at present, on the railroads.

With these facts the Troy and Greenfield Railroad Company crave the aid

of the State to enable them to complete an enterprise that is perfectly feasible, and which, independently of all advantages that will surely accrue, is destined, in after ages, to be a striking monument of the wisdom and energy of the people of this ancient Commonwealth.

Mr. PHELPS. Is this the old Petition of January, 1851, newly vamped up for the occasion? It has an ancient, and a fish-like smell.

Mr. DERBY. It has been drawn by a gentleman who has not seen the former petition on which the Report and Bill for a Loan were founded, and is adapted to the present state of the case.

Mr. DERBY then proceeded. We are met by the Western Railroad as we have been met before — with a sneer — we have on former occasions been met with sneers from the opponents of the project. Not, indeed, before a Committee of the Legislature, but it has been the fashion to meet its friends in the avenues and lobbies of the State-House with sneers. Now, however easy sneers might be made, they were not arguments to convince.

Galileo; Columbus, when he sought to demonstrate a new world; Fulton, when he made his first essay with steam on the Hudson river; and Ericsson, when, a few days ago, he launched his caloric ship for a new experiment, all were met by sneers. Yet the discoveries of Galileo and Columbus are immortal; the invention of Fulton has enriched a world, and every sea or navigable water is ploughed by the keel of the steam vessel. Ericsson, but a day or two ago, was not only met by a sneer, but there was pointed out to him, a man who sneered at Fulton's first experiment.

To come to the days of railroads; they in their inception were met by sneers. George Stevenson was cautioned when going before a Committee of the British Parliament to give evidence for the first railroad, (the Liverpool & Manchester,) not to say the engine could be made to go at a greater speed than 10 miles an hour; for heaven's sake, said the friends of the enterprise, don't say it will go fourteen miles an hour. He stood before the Committee. Astute Counsel, as in the present case, were retained to cross-examine him. Let me ask you, said the Counsel, on the responsibility of your oath, if you do not think it will go 14 miles an hour. He was a religious man, and so invoked, he was constrained to answer yes. Don't you believe, continued the Counsel, that it will go 20 miles an hour. Mr. Stevenson, notwithstanding the interests of his friends, knew no alternative but to answer according to the dictates of his conscience, and replied in the affirmative again. This had accomplished the object. "I have no more questions to ask you," said the Counsel, "about this new-fangled machine." He dismissed him with a sneer, and almost succeeded in defeating the railroad, although both he and his committee lived to see the locomotive go not merely 20 but 60 miles an hour. When we are met by remonstrants and by opponents in this way, we shall not meet them with sneers, but rely upon the more solid foundation of arguments and facts.

We ask the State to help us in doing what it has said we have a right to do. Some 13 years ago, he [Mr. Derby] was a stockholder and director in this same Western Railroad which now appears against us. When we came before the Legislature, we obtained a subscription from the State of $1,000,000 to the stock, without any security, and subsequently the State credit for $4,000,000 more. We pursued our devious path upwards of 1400 feet above the level of tide-water over the summit of the Berkshire hills. We carried the enterprise through. A member of the Legislature, who opposed it, had worked himself up to the belief that the road could not be completed without additional millions. He would not believe the final result, even though he saw it in the newspapers, and actually asked the Speaker if it was true as reported, that the road had been completed without demanding millions more.

Mr. DERBY would not be at all surprised if the Western Railroad Corporation

should say to the Petitioners, when you have received this aid you will want additional millions.

The object of the Western road at that time was aptly expressed by Hon. John Davis, when he said it was "to hang on to the improvements of the State of New York." The railway has been established. It has developed local business to a vast extent, has enriched the people on the line of the road, built up numerous and thriving villages, and has contributed to the wealth of the State some 40 or 50 millions of dollars, but it has not yet turned the mighty trade of the West towards Boston, amounting as it does now to upwards of three and a half millions of tons annually, received and delivered at the Hudson, although but seven hundred thousand tons, at the time the Western road was projected. This is shown by the striking fact, that at no time has the Western road taken more than 88,000 tons of this freight to Boston. This was in 1847. But a decline has been going on ever since. In 1848 the transportation was but 63,000 tons, 47,000 tons in 1851, and but 44,000 tons in 1852. The decline since 1850 has been somewhat accelerated by the opening of the Rutland road, which, although taking freight a circuit of 50 miles further, brings it to Boston cheaper.

The great fact thus made apparent is this: while we have appropriated some four or five millions for the construction of railroads to secure the trade of the West, while that trade is increased to three and a half millions of tons per year, and is increasing, we don't take the increase even of six months to Boston. The State of New York has two great avenues leading westward, earning an average of $300,000 per month. The State of Maryland has opened a great avenue, earning one or two hundred thousand dollars monthly. Pennsylvania has opened a new avenue to the Ohio, parallel to, and superseding her public works, and which is earning not far from $200,000 per month. But while the trade of the West is growing to gigantic proportions, while we are on the eve of a reciprocity with Canada, the Western road is conveying but 44,000 tons of this vast business to Boston. Yet we are met here by a sneer from these gentlemen, and are told that we have not a case which the Legislature would be warranted in assisting us to complete. Mr. Derby mentioned as a matter of fact, which should have some bearing on this case, that New York dedicated and devoted outright, $3,000,000 for the construction of the Erie railway.

The feasibility of the route proposed seems to be settled, and the fact also, that there will be a traffic to maintain it. A large proportion of the line has been already accomplished, and there is no grade going from Troy to Boston of more than 45 feet to a mile. You have then a railway on the other side of the mountains, beginning at Troy, and running to Hoosac village, connecting with the great highway from New York to Montreal. Of this 27 miles are finished, 7 miles more from North Adams to Williamstown are graded; all that remains to be built between Troy and Boston, is but one section through the base of the Hoosac, which, when completed, will make a line of 183 miles to the Hudson River against some 200 miles of the Western Railroad.

What we wish to accomplish now is, to take the credit of the State for $2,000,000, upon certain conditions. We pledge ourselves to make securities ample. The assistance that we ask will be sufficient to carry our enterprise through to completion.

Mr. Derby made some comments upon the composition of the Committee. The late President of the Western Railroad was now Speaker of the House. He did not complain of his selection, but in that part of the Committee selected from the Senate, he looked in vain for familiar faces from the Western part of the State, and from towns and counties along the line of the road. The great County of Berkshire, where the tunnel was situate, was not represented. The contiguous Counties of Franklin and Hampshire had no delegate on the Committee. The great County of Worcester, although upon the line, had none

also; and Middlesex appeared by a resident in her frontier town, the town of Hopkinton, on the line of the Worcester Railroad. Boston was deeply interested, and she appeared upon the Committee by one of her ablest and most efficient sons, one who had been foremost in the application for aid to the Western Railroad, in which he then was and still is deeply interested. The other gentlemen were from the remote Counties of Norfolk, Bristol and Barnstable.

Mr. PHELPS. Do you mean to insinuate that we have packed the Committee?

Mr. DERBY. Far be it from me to say anything so disrespectful to the presiding officer of the Senate; I mean to suggest that it is very obvious *we* have not packed the Committee.

Mr. PHELPS. Do you mean that you dislike the Committee?

Mr. DERBY. Far from it, we like the Committee. The Western Railroad had its strong men on the Committee when it invoked the State aid, and we have strong men on the line from Boston to Williamstown, but they are convinced already — we wish to convince those who are against us, even if they have real or imaginary interests adverse to ours, for their report in our favor will have a double value, will be invincible and conclusive.

We learn from holy writ, that in ancient times the high priest sent down Saul to the pleasant rivers and orange groves of Damascus to bring up the saints in bonds, to Jerusalem. But on the way a heavenly light illumined his path, and the agent of oppression became the great Apostle to convert the Gentiles. The light will, we trust, shine on this Committee and illumine their way.

We like the Committee. We are assured of their candid consideration of our petition, our evidence and our argument. In questions of this nature it is often best to have those upon a Committee who from their places of residence are not prejudiced in favor of the project presented to them. He appealed to the Committee as jurors; as such they would disregard sneers on the one side, and throw away local prejudices on the other.

It may be said that this subject has been adjudicated once. In January, 1851, we came before the Legislature. The Committee, of which Mr. Wilkins of Boston was Chairman, reported a bill and it passed the Senate by a vote of two to one, but was finally lost in the House. It was successfully opposed by the gentleman, who this afternoon represents the Western Railroad. If the case was adjudicated at all, it was by the report of the Committee, and its acceptance by the Senate.

The question at that time was comparatively new, money was at a high rate of interest, commerce was depressed. But how different now is the condition of things. All the great interests of the State are prosperous; railways are recovering, although they have suffered much from inexperienced Directors and Engineers. Money, instead of being at 10 to 15 per cent, is down to 5 per cent. State bonds are at a premium of 6 and 7 per cent. on the London Exchange. Every thing is different to-day, and we stand before you to-day in a stronger position than when the case was formerly presented. There is a great expansion of trade, gold is flowing in abundance, the avenues of trade are crowded, and all the great highways of the West, if we except the Western Railroad, are overwhelmed with freight which is giving expansion and affluence to Baltimore, Philadelphia and New York, to the exclusion of Boston.

The assessed value of the Commonwealth has risen in ten years from $300,000,000 to $600,000,000. We want to see this ratio continue. If the southern side of the Commonwealth has increased so much, we want to see what the northern side will do. There are men there, and industry and energy, and in developing these, we develope the strength and wealth of the State. We wish our sons and daughters, instead of emigrating to California and Oregon, to plant themselves on the beautiful streams in the northern part of the Commonwealth; we wish our kindred to grow up and remain within sight of their

own roof-tree, amid all the advantages of education and religion which so happily abound.

If we are told of the experiments of tunnels, and that they are scarcely known, we shall bring evidence to show that they are constructed in Maryland, even in that sleepy hollow, Old Virginia, in Georgia, and in Cincinnati a tunnel of one mile and a half in length is in process of construction to bring the railroads into the city. In Pennsylvania, the State constructed inclined planes to cross the Alleghanies at great expense, but private individuals are now constructing tunnels alongside these planes, in order to reduce the grade. We shall produce a mass of evidence in regard to the construction of tunnels. Two in England, 600 feet in depth and three miles long; on the Western road to Bristol the Box tunnel two miles long, two tunnels on the Manchester and Leeds road 1 3-4 and 1 1-4 miles long; on the Sheffield and Manchester, a short road, one 3 1-4 miles long and 600 feet below the surface, one on the North Midland road, one mile long, and tunnels for the Thames, and Duke of Bridgewater's Canal.

In England alone, from 50 to 100 miles of Canal and Railroad Tunnels beside miles of Adits and Tunnels through all the Mining Districts.

In this country, on the Hudson River and Reading roads, there are tunnels; fifteen on the Baltimore and Ohio road, aggregating two miles. On the Parkersburg road in the northwest of Virginia there are seventeen tunnels, aggregating three miles; on the Hempfield road six tunnels, and tunnels in Georgia, Kentucky and Missouri. Here are precedents in tunnelling, which we propose to offer in evidence.

Marseilles, a city, which, like our own, has suffered in obstructions to her commercial interests, has recently completed an aqueduct of fifty miles in length, ten miles of which are tunnelling; there is one tunnel three miles in length for her great Railway toward Paris, seven hundred feet below the surface. On a basis of $600,000,000, as the valuation of the State, doubling in 10 years, the savings of less than one fortnight will build entirely the tunnel we ask your aid to build. So much for involving old Massachusetts in an expensive undertaking.

But the question naturally occurs, How will this tunnel be constructed? There are two methods. One is by opening at either end, and progressing at the rate of three to four feet per diem, and meeting in the centre. The common old way is to sink shafts. In our tunnel, three shafts may be made, one 300 feet deep, the other two 775 feet, each, deep. By these shafts no less than eight parties may be kept constantly employed night and day. We are ready to show by evidence that the tunnel may thus be made for less than $2,000,000.

Another mode, but we shall not rest our case altogether upon it, is by means of the Excavator, which is yet in the hands of the proprietors. They have taken the machine to the mountain at great expense, and have put it in operation. They have demonstrated that it will progress from one to two feet per hour. We shall invite the Committee to see the machine in operation. Should it prove successful, of which there is scarcely any doubt, the cost of the tunnel will be reduced to $1,000,000.

The Railroad, should it be constructed, will reduce the distance to Troy 23 miles, but not only that, it will cut down a perpendicular elevation of 640 feet, avoiding severe curvatures. We shall satisfy you by the saving in grade and curvature, the Hudson being bridged at Troy, which it is not at Albany, there will be a saving in distance equal to 50 miles, equivalent to a reduction from Boston to Troy of one fourth the journey. When this line is completed, you will see at one end of the tunnel an enormous business, and at the other a noble harbor, the finest in the world. You will see a metropolis full of enterprise, intelligence and industry, and a population seeking employment for navigation.

But there is another ground upon which we ask this loan. The rich resources of the Deerfield and Hoosac Valleys are ample to support a local railroad. And still another which opens a brilliant future. A short and level line in New York from Hoosac bridge to Saratoga Springs, brings Boston within 185 miles, or 5 hours' ride of that great resort of the travelling public; and a line is chartered, and about to be made with easy grades from Saratoga to Sackets Harbor — the finest harbor in the Lakes. This will bring Lake Ontario within 336 miles of Boston. Actually nearer to Boston than Oswego to New York. But we begun with reducing the journey to Troy to the first bridge on the Hudson to the outlet of the enlarged Canal.

The simple question before the Committee, then, would seem to be this: 'Will you lend your aid to annihilate fifty miles of the distance between these two great points, that we may do what we propose, and thus enable us to enter into competition with New York for the vast and growing Western trade?'

We propose to give as security for the loan, the railroad. Forty miles of railroad including the tunnel is offered as your security. Should we fail in our enterprise, the State will have the road and the tunnel too. We should have no objection to taking the loan in this form — for every $100,000 we will give you two miles of railway and one thousand feet of tunnel. Assuming that the tunnel was thrown upon your hands, would not this lock, (reducing the distance to the West 50 miles,) let me ask you, would not this lock alone take toll enough to pay the interest? There is no property in this State that would offer so many advantages as a pecuniary investment, to say nothing of the inestimable blessings it would bestow upon the Commonwealth. The bonds shall be provided for by a sinking fund.

What is our position if our petition is denied? We go into the market with our bonds, and pay 8 to 9 per cent. interest. Armed with the State credit, we sell the bonds at 8 to 9 per cent. premium, which immediately forms the basis of a sinking fund, and we pay an interest of 5 per cent. This is the true view to take of this question. Massachusetts has an unrivalled credit the world over. Individual credit may be shaken, while that of the State will stand firm.

This great enterprise must be and will be eventually accomplished; shall it be delayed? Shall the old Bay State be thrown behind in the race, as it must be if the State withhold its assistance. Shall individuals be left to their inadequate, faltering efforts, bonds be issued at a discount, and the commerce of the State burthened with a permanent tax, as in the case of the Northern roads, of ten or twelve per cent. interest per annum., when four or five would have sufficed? Let the enlightened policy of the State forbid such a consummation. It will be, I trust, your province to protect the great interests of Massachusetts from such a needless sacrifice.

Upon the conclusion of Mr. Derby's opening argument, the Committee adjourned, with the understanding, that they would embrace the earliest opportunity, to go over the line of the Troy and Greenfield road, visit the Hoosac Mountain, witness the operation of the machine, constructed for tunnelling the mountain, and examine the resources of the country.

Subsequently, Tuesday, the 15th day of March, the Committee, together with the Counsel for the Petitioners and Remonstrants, and such others as desired to investigate the merits of the case, met at the Fitchburg Depot, and passing over Fitchburg and Vermont and Massachusetts roads, they arrived at Greenfield, across the Connecticut, at 12¼, P. M. Here the Committee were welcomed by the citizens, (who feel a lively interest in the projected tunnel,) and escorted to the Cutlery establishment, conducted by Messrs. Russell & Co.

This is one of the largest establishments of the kind in New England. Three hundred operatives are employed, and they finish ready for market, six hundred dozen knives and forks daily. The Company are able to compete successfully

with English manufacturers, and find a ready market for all the cutlery they can make.

After dinner, the Committee visited a large establishment for the manufacture of carpenter's tools, recently erected and put in operation. The tools are manufactured from beach timber, which is found in abundance in Greenfield and the surrounding towns. Here some 200 men find employment. Greenfield, the shire town of Franklin county, is beautifully situated, has a bank capital of $350,000, a Savings Bank, with $200,000 deposited in it — has many delightful residences, and is in the midst of a fine agricultural country of great fertility. At this point, commences the line of the Troy and Greenfield Railroad. Passing on from Greenfield, the Committee reached Shelburne Falls, a distance of 10 miles, about 5, P. M. This is a very thriving town, and, as its name indicates, possesses great manufacturing capabilities. The waters of the Deerfield River here fall seventy feet in a few rods, and can be used three times over as a motive power. Here, as at Greenfield, there is also a large Cutlery establishment, which the Committee visited, at the invitation of the proprietors, Messrs. Lamson, Goodnow & Co. Their factory has been recently erected and is not yet in full operation. They now employ some 250 men, and turn out 300 dozen of knives and forks daily; when in full operation they will employ 500 men. The river is controlled by a dam built for $1,000, and contains water sufficient to carry fourteen similar factories. A superb hotel has been recently erected here, built of a grey-stone, quarried about a mile distant. It is kept by Mr. Wm. C. Perry, and furnished ample accommodations for the whole party, some seventy in number.

The place has largely increased in population and wealth, in anticipation of the completion of the Troy and Greenfield Railroad, and there is room for almost indefinite expansion, as but a small portion of the water power is now used.

Wednesday, *March* 16.

After an early breakfast, the Committee proceeded up the picturesque and fertile valley of the Deerfield, a distance of 16 miles, to Rice's Hotel, which is about three-fourths of mile from the entrance to the proposed tunnel. Here the Committee met a delegation of citizens from North Adams, on the west side of the mountain, and from the city of Troy, N. Y. From the hotel, the Committee and others interested, proceeded to examine the mountain and witness the operations of the machine in excavating the rock. After a careful survey of the machine by the Committee, to become familiar with its structure, it was set in operation, and run 15 minutes, when it was found by measurement to have cut into the rock, *four and one-eighth inches*, or at the rate of 16½ inches per hour. The weather was very cold, and both the machine and the rock were filled with frost; consequently, the operators did not dare to test the machine to the extent of its capacity. Under more favorable conditions, it had cut twenty or more inches per hour. The operations of the machine seemed to give great satisfaction to all who witnessed them.

Leaving the tunnel, the Committee started in sleighs to ascend the precipitous, though fertile sides of the Hoosac Mountain. On reaching the summit, the Deerfield Valley below, and the successive ranges of the Green Mountains, beyond and around, presented a panoramic view, rarely exceeded in beauty. The top of the mountain is an undulating plain, covered with fertile farms, and these are seen beyond the Hoosac summit, upon the mountain sides and tops, as far as the eye can reach. This evidence of fertility, at a height of fifteen hundred to two thousand feet above the ocean level, surprised all not before familiar with the country. In a dwelling-house not far west of the summit of the mountain, is kept the post-office of the town of Florida.

Descending the mountain on the west, the valley of the Hoosac River was presented to view, and at the foot of the mountain lay the village of North Adams.

The Committee arrived at North Adams in season to visit a few of the factories, of which there are some twenty, and to see other objects of interest in the town. Adams is an excellent agricultural town, and possesses great facilities for manufacturing. It contains 6790 inhabitants.

Thursday, March 17.

Leaving North Adams, the Committee proceeded down the Hoosac valley by the side of the Troy and Greenfield Railroad, (which is here graded ready for the rails, a distance of 7 miles,) through Williamstown, Pownal in Vermont, and Hoosick in New York, to Hoosick Falls, where they took the cars for Troy. The Hossac valley rivals the Genesee in fertility, and nowhere can more productive farms be found than in this valley. The subjoined table was furnished the Committee by Judge Ball, and will show the extent of the products of one town.

Hoosick, N. Y., contains 39,300 acres of land. Its products for 1850 were as follows: —

Horses,	819
Milch Cows,	1,133
Working Oxen,	304
Other Cattle,	1,253
Sheep,	33,888
Swine,	3,089
Value orchard products,	$9,885
Butter, pounds,	88,256
Cheese, pounds,	38,812
Flax, pounds,	93,905
Wool, pounds,	101,664
Wheat, bushels,	3,437
Rye, bushels,	20,718
Corn, bushels,	74,042
Oats, bushels,	73,120
Peas and beans, bushels,	1,577
Potatoes, bushels,	37,337
Barley, bushels,	4,857
Buckwheat, bushels,	5,458
Tons hay,	9,525
Flax-seed, bushels,	3,895

The total value of the products is estimated at rising $1,000,000.

The town of Pownal, Vt., through which the railroad passes is hardly inferior as an agricultural town to Hoosick.

The Committee arrived at Troy about 2, P. M., where they were cordially received by the citizens of Troy, who, having pushed their road nearly up to the mountain, are anxious that Massachusetts should meet them at the border of their State, and thus complete the great avenue of communication between Troy and Boston.

At Troy the Committee visited the spot, on which the Union Railroad Co. are now building an immense depot, near the lowest railway bridge across the Hudson, to concentrate the various railroads, having their termini in the city, at one point. To effect this desirable object, the city of Troy have loaned their credit to the amount of half a million of dollars.

Friday, March 18.

The Committee took the cars by the Hudson River Railroad for New York, where they arrived a little past 12 o'clock; the last forty-two miles having been run in fifty minutes.

The principal object in visiting New York, was to witness the operation of a number of machines similar to that at the Hoosac Mountain, employed in the stone-cutting business, by the Empire Stone-Cutting Company, located upon

East River, at the foot of 28th Street. The Company employ 370 men, and have some dozen machines in operation.

The Committee repaired to this establishment, where the machines were set in operation upon various qualities of stone. The Connecticut, or red sandstone was reduced to a smooth surface with great rapidity. The workmen assured the Committee, that the mica slate, composing the Hoosac Mountain, (a specimen of which was shown them by the Committee,) is less difficult to cut than the sandstone they were then cutting, on account of the grit of the latter, which dulled the cutters.

A block of greywacke, a very hard compact stone, harder, the workmen assured the Committee, than the Quincy Granite, was placed upon the carriage for the action of the cutters. The block was 6 feet 4 inches in length, and 18 inches in width. The machine was set in operation — the block trembled — the fire rolled from the cutters — the stone chips flew for nine minutes, in which time a portion, an inch and a half in thickness, had been cut from the entire extent of the block, and the whole reduced to an even surface.

Other machines were operated, some cutting vertically, others horizontally, and all with the same general success. The action of these machines could be better seen than the action of the machine at the mountain, being many times smaller, and so situated that the actual process and progress of the cutting could be observed without difficulty. The principle of the machine at the tunnel, and of those operated, and their method of cutting, are identical.

Saturday, March 19.

The Committee having accomplished the purpose of their tour, returned to Boston.

Wednesday, March 23.

Hearing before the Committee resumed. JOHN PORTER called.

"Reside in Buckland, two miles from Shelburne Falls. Have been a representative in the General Court, and a member of the Governor's Council. I have prepared tables of the population, on the line of the Western Railroad in 1837, one year after the commencement of that road, and of the population on the line of the Troy and Greenfield Railroad in 1850 and 1853. The population in 1837 I obtained from the State Register, that of 1850 from the Census Report, and that of 1853 from actual count in some instances, and in other cases from the estimates of people best acquainted with the subject. The tables are as follows.*

The anticipated completion of the Troy and Greenfield Railroad has caused a large increase of population, in some places upon the line of the road. The natural resources upon the line of the Troy and Greenfield Railroad, are vastly greater than those upon the line of the Western Railroad. The soil along the Deerfield River is very productive. We have large quantities of timber rotting upon the ground, because we have no means of getting it to market. We have many valuable minerals, excellent marble in Adams, beautiful specimens of serpentine that take a high polish, soapstone of superior quality in Florida, great quantities of quartz and flagging-stones in Charlemont, and iron ore in Hawley. Quartz largely used in the manufacture of glass."

Cross-examined. — "The towns immediately upon the line of the road, are Greenfield, Shelburne, Deerfield, Charlemont, Florida, and Adams. The soil of Deerfield is good. The increase in population of Shelburne and Buckland is principally at the Falls. The other towns I have mentioned are principally farming towns, some tanneries, gristmills, sawmills, &c., principally for local purposes. The Troy and Greenfield Road has been graded about seven miles, from North Adams towards Hoosac Falls.

But a small portion of the first growth of timber has been cut off, on the line

* See next page for Table.

of the road. The pastures are good on the highlands. Franklin county is said to send more beef to market than any other county in the State."

Population on 1st Division Western Railroad in 1837.		Population on 2d Division Western Railroad in 1837.		Population on the Troy and Greenfield Railroad in 1850 and 1853.		
					1850.	1853.
Springfield,	9,234	West Stockbridge,	2,036	Williamstown,	2,626	2,880
Ludlow,	1,329	Richmond,	820	Adams,	6,172	6,790
Long Meadow,	1,251	Pittsfield,	3,575	Clarksburg,	334	425
Wilbraham,	1,802	Lenox,	1,275	New Ashford,	186	220
Hadley,	1,805	Lee,	2,095	Cheshire,	1,297	1,397
Granby,	922	Washington,	758	Savory,	955	975
Belchertown,	2,598	Becket,	957	Monroe,	254	320
Palmer,	1,810	Hancock,	975	Florida,	561	730
Monson,	2,179	Lanesborough,	1,090	Pownal, Vt.	1,742	1,800
Brimfield,	1,518	Dalton,	830	Bennington, Vt.	3,923	5,000
Weston,	1,196	Mt. Washington,	377	Stamford, Vt.	833	900
Ware,	2,403	Hinsdale,	832	Readsborough, Vt.	857	1,200
Hardwick,	1,818	Windsor,	887	Halifax,	1,133	1,400
New Braintree,	780	Peru,	656	Whitingham,	1,380	1,700
Brookfield,	2,514	Middlefield,	760	Wilmington,	1,372	1,372
North Brookfield,	1,509	Otis,	1,077	Rowe,	659	750
Sturbridge,	2,004	Blanford,	1,443	Heath,	803	880
Charlton,	2,469	Chester,	1,290	Coleraine,	1,785	1,950
Spencer,	2,085	Cummington,	1,204	Charlemont,	1,173	1,290
Leicester,	2,122	Newark,	714	Shelburne,	1,239	1,950
Enfield,	1,058	Worthington,	1,142	Deerfield,	2,421	2,663
Worcester,	7,117	Montgomery,	497	Hawley,	881	960
		Russell,	475	Buckland,	1,058	1,725
		Southwick,	1,291	Ashfield,	1,394	1,533
		Westfield,	3,039	Plainfield,	814	925
		Granville,	1,439	Conway,	1,831	2,000
		West Springfield,	3,227	Greenfield,	2,580	3,000
	51,523		34,711		40,250	46,735
Average population per mile for whole distance, 55 miles, - - - -	936.	Average population per mile for whole distance, 62 miles, - - - -	559.	Average population per mile for whole distance, 40 miles, - - - -	1,006	1,158.

R. H. Leavitt, called.—"Reside in Charlemont. Am a farmer. Think Mr. Porter's statement very accurate in the main. Soapstone quarry lies in Rowe near the mouth of the tunnel. Iron ore in Hawley has been worked, and is of good quality—not now worked for want of means of transportation. Tanneries have increased. The hemlock timber is mainly left to rot upon the ground after the bark is taken off. Exhibits a block of flagging-stone. I brought this from the quarry, easily quarried, can take off slabs 25 by 18 feet, varying in thickness from one to eight inches."

Cross-examined.—"The soapstone quarry is not constantly worked, only occasionally, for want of facilities of carriage. There are two tanneries in West Hawley; employ ten to twelve men. Timber left to rot in Charlemont and on Cold River. Our towns are principally agricultural. Shelburne Falls largest manufacturing town. Facilities for manufacturing great all along the Deerfield River."

A. F. Edwards, Civil Engineer, called.—"As no work of the magnitude and character of the proposed tunnel through the Hoosac Mountain has been performed in this coutry, its *feasibility*, cost, and the *time required* to perform so great work, became subjects of inquiry. In Great Britain, and on the continent, numerous tunnels through rock and earth have been constructed, some of which in the quantity of the material moved exceed, and in length approximate to this. Some, also, in the character of the material excavated and moved, much more difficult and expensive.

"The question heretofore has been raised, as to the probable effect of the passage of the trains through tunnels. In reply, I refer you to the printed report signed by Drs. Parr and Watson, Mr. Lawrence, Mr. Phillips and Mr. O. Lucas. The experiment made by them was in the tunnel near Primrose Hill, near

London. The westerly end was only partially opened; the ventilation, therefore, was not so complete as it is at the present time, the whole being now finished. 'We found,' says the report, 'the atmosphere dry, of an agreeable temperature, and free from smell, the lamps of the carriages were lighted, and in our transit in and back again to the mouth of the tunnel, the sensation experienced was precisely that of travelling in a coach by night, between the walls of a narrow street. The noise did not prevent easy conversation, nor appear much greater than in the open air.'

The reports of Drs. Davy and Rothman, and also of Dr. Williamson, Senior Physician of the Leeds General Infirmary, as to the Leeds and Selby Tunnel, are eqally satisfactory.

In 1838, Messrs. Swift, McNeill and Whistler, in their report to the Directors of the Western Railroad, say: 'The cost of an open cut in earth 70 feet deep is $70 per lineal foot: in a rock cut 60 feet deep, 20 feet at bottom, with slopes one to five, the cost would at $1.12½ per cubic yard be $67.50 per lineal foot — finally the cost of a tunnel in rock of mica-slate or gneiss of 22 feet in width, by 18 feet in height, would be $65 per lineal foot.' John Childe, Civil Engineer, estimates tunnelling in the same quality of rock at $60 per running foot. Upon an examination of the Eighth Annual Report of the Directors of the Western Railroad to Stockholders, and the Seventh Annual Report of the Directors of the Western Railroad to the Legislature of Massachusetts, January, 1843, I find that the cost of the tunnel on the Western Railroad in rock, the sides and arch being exclusively of the natural rock as above, was $63.87 per lineal foot, or $3.52 per cubic yard, being $1.13 per lineal foot less than the estimate.

In Aug., 1842, Mr. Vignoles, in his lectures on Civil Engineering at London, said 'the average cost of tunnelling upon the principal railways as actually executed appears to be about £60 per yard forward, in some instances as much as £100, especially where driven forward in reckless haste, and in attempting to sink shafts, or drive drifts without due consideration as to the quantities of water in the various strata, or the means of at once grappling with the difficulties of draining or pumping.

With great facilities, favorable material, and not too much hurrying, the same area of tunnelling has been driven for so little as £20 per yard forward — that for future tunnel operations, with the benefit of past errors, experience, and by avoiding an undue haste in execution, and with sufficient caution and activity, £40 per yard forward for tunnelling may be taken as an average, approximate fair price.' Robert Stevenson, one of the most celebrated of English Engineers, estimates the cost of constructing long tunnels at £32 per yard forward, and for short tunnels at £26 per yard forward.

And for further evidence, I refer you to the following Table, where I have given you the length of several tunnels, the cost, &c. as far as I have been able to procure reliable facts.*

By the above Table, as far as I am able to obtain the cost per cubic yard, the Hoosac Tunnel will not exceed $1,225,000. This is not my estimate as I have gone carefully into details of the work, after adding largely for machinery, tools, and incidental expenses, and included them in my price per cubic yard. I have again added them in detail to the principal items, which you will see in another portion of this report.

The geological formation of the Hoosac Mountain, in the vicinity of the proposed tunnel, is mica and talcose slate, except for about half a mile on the western slope, which is of the calcareous formation, of the saccharoid limestone of numerous gradations of texture and color, together with a bed of the brown hem-

* See next page for Table.

Table of Tunnels.

		Length in feet.	Length in miles.	Remarks.
Cambry and St. Quetin Canal	. .		$3\frac{1}{2}$	
Dudley Canal .	Lapal		$2\frac{14}{100}$	
" " .	Halsowen	1,869		
" " .	Dudley Woodside	8,778	$1\frac{66}{100}$	
Grand Junction Canal	. .		$1\frac{16}{100}$	
" " .	Blisworth		$1\frac{3}{4}$	
Leeds & Liverpool Canal	Gannet	1,677		
" " .	Foulbridge	4,920		
Leominster and Kingston Canal	Sousant	3,750		
" " .	Sappertan	12,900	$2\frac{44}{100}$	
" " .	Peusax		$2\frac{18}{100}$	
Thames & Medway Canal	. .		$2\frac{1}{4}$	
Thames & Severn Canal	Tarleton		$2\frac{3}{8}$	
Trenton & Mersey Canal	Hare Castle	8,778	$1\frac{66}{100}$	Area 224 feet, cost per lineal foot $23.91, per cubic yard $2.89, progress per day 16 feet 8-100.
Cromford Canal .	Ripley		$1\frac{68}{100}$	
Philadelphia and Reading R. R.	Pulpit Rock	1,638	.	Cost $3.30 per cubic yard, in hard blue sandstone with veins of quartz.
" "	Black Rock	1,932	.	Cost $5.58 per cubic yard, a hard, compact, graywack slate, exceeding difficult to work, and the most expensive in its construction on record.
Chesapeake and Ohio Canal	. .	3,118	.	Cost $3 per cubic yard, slate rock, of average hardness for drilling.
Baltimore and Ohio Canal	. .	1,207	.	Cost $3.40 per cubic yard, a hard blue slate rock.
Baltimore and Ohio Railway	. .	4,100	.	Cost $3 per cubic yd., sandstone and slate, of which 3000 feet of heading was made at an average of 12 feet 82-100 per day.
South Eastern Railway	Blitchingly	3,972		
Liverpool Railway	. .	6,000	$1\frac{14}{100}$	
Midland Railway	Roystone		.	Cost $80.55 per lineal foot, red sandstone.
South Eastern Railway	Saltwood	2,862		
Huddersfield canal	. .		$3\frac{15}{100}$	
Camford and Highpeake	Buxton	1,740		
Great Western Railway	Box		$1\frac{83}{100}$	Freestone rock, completed 782 working days.
Rouen and Havre	Tunnels	18,882	$3\frac{58}{100}$	
Marseilles and Avignon	Nerthe		3	
London and Birmingham R. R.	. .	11,560	2	
Sheffield & Manchester	. .		3	Rock formation its entire length.
Mexico . .	Nochtistongo	21,659		11 feet wide, 13 feet high, built in one year.

Weymouth Colliery has a shaft 1578 feet deep.

atite iron in all its forms. This vein or bed of iron ore, the North Adams Iron Company have a lease of, and have worked the same in connection with other ores. In passing from the east to the west, from the commencement of heading of tunnel on the east the surface of the ground rises about 650 feet in the distance of 1500 feet, which brings you to the point where the tunnel is to pass under the present mountain-road ; from the road to the easterly summit the distance is 4000 feet, with a gradual rise of about 750 feet ; thence the ground gradually descends to the lowest point on the straight line as run. Should the line be thrown, at this point, more southerly, thus making a slight curve, the elevation could be very materially reduced and would lessen the depth of the main shaft, provided it was thought advisable, after more mature deliberation, to about 650 feet. From this point the ground again ascends by slight undulations about 50 feet in the distance of 500 feet, thence by a true slope the ascent is 200 feet in the distance of 1000 feet, thence by a gradual rise of 50 feet in 2000 feet, thence the rise is somewhat broken and irregular, being 650 feet in the distance of 5000 feet, which point is the apex of the western peak or summit. From the western peak the ground descends very precipitously, in one place overhanging 10 feet in 100 feet, to the westerly end of tunnel. The elevation of the easterly end of tunnel is 765 feet, the westerly end 770 feet, and in the centre about 800 feet above tide, making the grade line of the same at an intermediate point, about midway of the two summits, about 750 feet below the surface. Over this section of the road the soil for the most part is good, being well adapted for grazing, dairy and the coarser grains, is improved and under a good state of cultivation by the hardy yeomen of Berkshire, who have rendered me every attention I could ask in my numerous examinations, and have executed bonds of all the land that may be wanted for the purposes of the road, without a single exception, at the rate of $10 per acre for all on the surface, and one dollar per acre for any purpose under the surface, which bonds are for warranty deeds and will be fulfilled to the letter. I am informed that not a single town or State pauper resides within those limits.

On this mountain, in this vicinity, the direction of the mica slate range is about north and south, or about 10 degrees variation from a right angle with the centre line of the tunnel. The dip will average about five degrees from a vertical line, the top sloping or inclining westerly.

Edward Hitchcock, President of Amherst College, the Massachusetts State Geologist, and other scientific men in the hearing before the Committee of the Legislature in 1851, testified that the Hoosac Mountain on the line of the proposed tunnel, was composed mainly of mica and talcose slate ; that the whole of the mountain, from the most reliable indications, was of the same material, unless some limestone should be found at the western base. They further stated "that the rock is highly stratified and the dip nearly vertical." The centre line of the tunnel passes through the rock nearly at right angles to the stratification, and therefore the rock lies in the best possible position for tunnel excavation. I have also consulted with Professor Emmons of Williamstown College, the State Geologist of New York, now making the Geological Survey of the State of Virginia, and he concurs fully in the opinions above expressed by Edward Hitchcock, as to the geological formation of the Hoosac Mountain in the vicinity of the proposed tunnel. The tunnel will be 24,100 lineal feet from heading to heading, and in width sufficient for a double track, will vary from 22 to 24 feet in the extreme, the top being semicircular, of which the 24 feet is the diameter, the extreme height is $20\frac{1}{2}$ feet, a cross section of which per the plan and slope contemplated (provided it is worked in the ordinary way with the increased facilities the present steam drills now in use will give) will contain an area of 405 square feet,—45 square yards and in volume equal to 15 cubic yards per lineal foot, making the total amount of excavation 361,500 cubic yards ; should there be

only the usual run of water to contend with, which is the most natural conjecture from its geological formation and locality, the grade, viz., $26\frac{4}{10}$ per mile as a maximum or 6 inches in 100 feet, the area can be reduced 15 square feet on a lineal foot—13,383 cubic yards on the whole length, which amount deducted from 361,500 equals 348,112 cubic yards, the probable amount to be excavated in the tunnel.

The cost of excavating the tunnel is as follows, viz: the drift marked 'A' on plan=36 cubic feet in each foot of length at 50 cents per cubic foot, $13.50 per cubic yard. The Cochituate Tunnel at Newton, in area $41\frac{1}{2}$ feet, (a mere trifle larger than drift,) cost $15 per cubic yard, and was through rock of peculiar hardness, and the work was much embarrassed by the water which flowed in from the earth covering the rock. These tunnels, 3410 and 1150 feet=3560 feet in length, in a rock much more difficult to excavate from its geological formation and hardness, and at the same time being confined to a particular size and shape; the greatest care was necessary to prevent the shaking of the exterior surface, and at the same time not to excavate any more than the size required for the aqueduct, as it would have to be re-filled with concrete masonry. Such was the vigilance exercised that the quantity moved only exceeded by 189 yards, the required dimensions, in the tunnel of 2410 feet in length. Again, this work was done by the day, the contractor had a profit on each man and the use of tools, and a price which the City in the settlement with the contractors fixed at $16 per cubic yard, as covering all expenditures and profits, which price is only 9 cents more a foot than I have estimated for much easier work, and without any limitations as to extra blasting or any seams or quantity started on the right or left or on the base—which excess of nine cents per foot is ample, carried in my item of contingencies—as all contingencies are included in this cost of the Newton Tunnels. The sidings marked 'B.' 'B.' 100 cubic feet in each foot in length at 30 cents per cubic foot, or $8.10 per cubic yard; the remainder or main face marked 'C.'=269 cubic feet in each foot in length at eight cents per cubic foot, or $2.16 per cubic yard, it being the same as a thorough cut after sections 'A.' 'B. and B.' are worked except that it will be under ground, instead of the open air, with the advantages over a thorough rock cut of no clearing off, and no lost time on account of bad weather, each and every hour of the 24 being actual day by artificial light, at which prices the area as marked 'A. B. B. and C.' containing 15 cubic yards, will cost $69.52 for each foot forward=$4.63\frac{1}{2}$ per cubic yard; making the whole amount for excavating the Tunnel $1,675,432.

The above prices per yard are very much increased from what they truly ought to be, from the fact that I have included all the cars, tools, tracks, air-pipes, machinery, superintending, engineering, incidental and contingent expenses, and divided them pro rata on the different parts of the area—as a previous board of the directors was very desirous I should have my estimate sufficiently high to cover every expenditure and contingency—to which estimate I make the following additions: $6\frac{1}{4}$ cubic feet of masonry in each lineal foot=6,025 perch at $5=$30,125; cast-iron air-pipes, boxes, fan, furnace and machinery for ventilation during the construction only, $54,000; superstructure, including the iron and laying the same $64,000. Total cost of excavating the tunnel without any shafting, including $125,000, for engineering and contingencies $1,968,557. The number of men employed on one face directly and indirectly is 53, with a shift of hands every eight hours=159 workmen of all kinds on one face for 24 hours, to which is to be added the transportation expenses, powder, ventilation, tools, materials for track, cars, turn-tables, slides, lights, machinery, general superintendent, inspector, engineer, and incidentals and contingencies, and you will have the daily expenses on one face. The progress per day will depend entirely on the advancement of the workmen at section A., who,

their work being mostly done by machinery, will advance eight feet forward in 24 hours, (the rate of progress made by myself in various experiments on the rock at the mountain,) at which rate without any shafting, allowing 50 days to prepare and start the end drifts, will take 1556 days to complete the whole.

But as 502 days of time can be saved, equivalent to $167,333 — the interest on $2,000,000, at 6 per cent. per annum on the capital, and twice that amount in the net earnings of the road, I should recommend an extra expense, or outlay, of $148,440, for sinking two shafts; viz., shaft No. 1, 2000 feet easterly of the west end, equal in area to $176\frac{717}{1000}$ feet, and 300 feet deep, at 30 cents per cubic foot, or $8.10 per cubic yard = $15,904. This shaft can be sunk at the rate of 6 feet per day, or in 50 days, then allowing 50 days on each end to start the drifts, on the 51st day we have 4 working faces. Now, allowing the progress made on each face at the shaftings, is one-half the rate at the ends, we shall have at the end of 216 days, a passage opened from shaft No. 1, to the west end, and 3984 feet of tunnel excavated. In the mean time, shaft No. 2 has been progressing, which was commenced at the same time. It is located about one-fourth of a mile easterly of the centre, and nearly midway of the two summits, and will be in ellipse form 15 feet transverse, and 30 feet conjugate diameter — or double and round with a diameter of 15 feet = in area $353\frac{43}{100}$ square feet, the depth will be about 750 feet, and at 50 cents per square foot, will amount to $132,536, equal to $176.7 for each foot in depth. In these prices of the shafts, are included all the machinery for excavating them, together with all the additional power and fixings wanted in the working the tunnel, over and above the end faces, viz: two steam engines, of the same pattern, two pumps, and all machinery in duplicate, with a duplicate piece of each machine on the spot, ready for any emergency, the lining of the shaft, the puddling, the windlass, the lateral tracks at surface, the extra car-tops, incidentals, contingencies, superintendence, and engineering. This shaft can be sunk at the rate of 4 feet per day, or $1\frac{1}{3}$ foot for each shift of hands, thus completing the shaft in 216 days, and starting the drifts each way from the shafts, thus, enabling us to continue our 4 working faces as before, and reckoning the parties at shaft No. 2, to make the same progress on the face, as at No. 1, or one half the rate of those from each end — say 4 lineal feet per day to each, or 8 feet for both faces from the shaft, it will require 838 days in addition to the 216 days — thus, making the total time 1054 days of 24 hours each, from its commencement to its completion.

At the same rate as the Box Tunnel on the Great Western Railroad, one mile and about four-fifths in length, 39 feet high, and 35 feet wide, — in quantity of excavation, 414,000 cubic yards through sandstone and earth, at a cost of $1,600,000, or $3.86 per cubic yard, which includes masonry and all contingencies — the Hoosac Tunnel will cost $1,391,390; also the Hare Castle Tunnel on the Trenton and Mersey Canal, one mile and about seven-tenths in length, 14 feet high, and 16 feet wide, in quantity of excavation, 72,825 cubic yards, at a cost of £43,435 = $209,936, or $2.89 per cubic yard, at which rate the Hoosac Tunnel would cost $1,044,735. This tunnel was constructed in 21 months. Then there is the Huddersfield and Manchester Railway — 'Marsden Tunnel' — upwards of 3 miles in length. And on the Railway leading from Marseilles to Avignon, is the 'Nerthe Tunnel,' about 3 miles in length, through solid rock. The main shaft being 610 feet in depth. This Tunnel cost $4.54 per cubic yard, including masonry and every expense. Should the average of the 'Box,' Hare Castle, and the Nerthe Tunnels be taken as a basis, the Hoosac Tunnel would cost $3.76\frac{1}{2}$ per cubic yard, = $1,361,047.50.

By the above, you will perceive that I have based my estimate on the line having the longest tunnel, although the tunnel on the other line is one-half a

mile shorter. On the line with the shortest tunnel, there will be an additional distance in the length of the road upwards of one mile; equivalent to $60,000 in its working and increase in the maximum grade, while on the line as adopted, I can speak with great confidence, that the extra distance or length of tunnel will cost comparatively nothing, being composed for the most part of the brown hematite iron, which will readily sell for $3.50 per cubic yard att he mouth of the tunnel, to which, add the profits arising from the transportation of the same over the road, together with a large increase from the same source at a future date. Yet, in my estimate, I have made no deduction, calling it the same as other portions of the tunnel, which, if I am correct, will allow $125,000 more for contingencies in addition to amount, as reckoned.

Again, from the time the charter was granted to the Troy and Greenfield Railroad, when the feasibility of tunnelling the Hoosac Mountain was settled by the people in the act of the Legislature of Massachusetts, beyond a possibility of doubt, the mechanical and engineering talent of the Yankee combined, have been turned to the most economical method for its construction, in the shortest possible time. And among the various improvements in machinery for drilling stone, and making excavations, no machine at the present day should command the attention of railroad men, more than Wilson's Patent Stone-Cutting Machine, for tunnel excavation in rock; the first working model, of 100 tons weight, is now at the Hoosac Mountain, experimenting in various ways, and perfecting the principles of the same. The result of its workings in the natural rock, under every disadvantage, in the different experiments, has been from 14 to 24 inches forward per hour, on a full circle of 24 feet diameter; exceeding the expectations of its most sanguine friends, and bidding fair to revolutionize the whole system of railroad building. At the view, by the Committee of the Massachusetts Legislature, of the working of the model, under many disadvantages, the machine cut the rock at the rate of $1\frac{1}{3}$ lineal feet per hour, with the thermometer at only two degrees above zero, on that morning, although exposed in the open air, with all its cast-iron fixtures, which should be of wrought-iron. The machine has never worked less than 14 inches per hour. To show with what progress this tunnel could be worked, I will say the machine will cut 12 inches per hour, $33\frac{1}{3}$ per cent. less than was actually witnessed by the Committee of the Legislature. In two hours, the machine will cut at that rate 2 feet forward; the ring of the tunnel, of which the diameter is 24 feet, interior diameter of the core 22 feet. Making in quantity cut, $2\frac{3}{4}$ cubic yards, thus, leaving a core of 22 feet diameter = 14 cubic yards, to be taken out by blasting, the same to be transported out under the machine after it is run back, which I propose to rest for 2 hours, that the machine and engine, which is to be attached to the machine for its working and its locomotion, when perfected, may be examined, wiped, oiled, and any cutter or nut adjusted. During this two hours the core will be blasted by means of cast-iron shells, so encased in wood, as to fit exactly a portion of the ring; the same will be fired by electric battery.

The space under the machine being 7 feet high, and 10 wide, and a second track, (narrow gage,) laid between the machine track gage, for the transportation cars, the cars (very low platform) will be run up and loaded. The $2\frac{3}{4}$ yards of dust to the foot, or $5\frac{1}{2}$ yards for the two-feet chip-cutting made by the machine, (being transported out while the machine is in operation,) but 14 yards to a foot, or 28 yards for the two feet, remains to be moved in the two hours = or 10 car loads. It will not be necessary to transport the whole (10) out in two hours, as the space between the machine and tracks will admit of their having two or three car-loads between the rails, which can be transported out while the machine is at work.

One man will move 30 yards of stone in a day of ten hours with all ease, and on masonry work the average exceeds this. The moving and unloading cars is

comparatively small,—the average time for loading, replacing the same with empty cars, will be 15 minutes, which can be done with all ease by eight men. Only 6 car loads of stone to be moved in one foot=12 car loads in two feet, and as the two car loads, contents of the ring, and two car loads between the machine and the rails are transported in the two hours, while the machine is at work, but eight car loads remain to be moved in the two hours that the machine is idle, while the whole tunnel excavation will advance two feet on one face in four hours=12 feet in 24 hours, and with two machines, one at each end, at the same rate, will progress 24 feet per day—thus completing the entire excavation of the whole tunnel, and present a hammered faced surface upon each and every side in 1005 days."

Otis Clapp, Esq., of Boston, called —"Have been a Director of the Troy and Greenfield road. My attention was first called specially to the subject as a member of the Legislature in 1851. Have given much attention to the various tunnels now in progress in this country. Visited the South and West in December last, for the purpose of obtaining information as to the number of tunnels built, and now building, their cost, mode of ventilation, &c. &c. Was kindly furnished with letters to engineers and railroad officers, who very readily afforded the information sought for.

Went South as far as Richmond, Va., and called upon the Secretary of the Board of Public Works. The citizens of Virginia, with the aid of the State, are carrying forward a very complete system of railroads intended to develope the resources of that State. The State Government have already granted aid to these improvements to an amount exceeding twenty millions of dollars. There are already made, or now building nearly 30 tunnels in this State.

The Central Railroad, which crosses the Alleghanies and which is to unite Richmond and Eastern Virginia with the Ohio River, has four tunnels. The rock in a portion of them is much harder to excavate than Quincy granite. Documents giving an account of them, with specimens of the rock, were furnished me, which were intended to be put into this case, but they were unfortunately stolen with my baggage at Wheeling.

The Baltimore and Ohio Railroad there are 16 tunnels. The Engineer, B. H. Latrobe, Esq., kindly furnished the following list of them, which gives the length, cost per cubic yard, quality of stone, &c. &c. *

The tunnels on this road formed but a small part of the obstacles encountered, as the bridges, (114 in number,) deep cutting, and embankments go far beyond any thing in this section of the country. I was informed that the obstacles overcome are greater than those which have been encountered on any road ever yet built in the world. The cost, notwithstanding, is $10,175 less per mile than the New York Erie Road.

This road has also a branch now building called the North-Western Virginia Railroad, 103 miles long, terminating at Parkersburg, on the Ohio River, on which there are 17 tunnels. The city of Baltimore has guaranteed its bonds to the amount of $1,500,000, and the Baltimore and Ohio Road to the amount of $1,000,000 more, although their own road has already cost between 18 and 19 million of dollars. These tunnels vary in length from 300 to 2700 feet. The five longest are respectively 2700, 2408, 2464, 1825, and 1374 feet in length. The cost varies from $1.50 to $3 per cubic yard. The tunnels on the Baltimore and Ohio Road are all in use but one—the Broad Tree, which is to be arched. In the meantime, the track goes over the mountain at a grade of 300 feet to the mile, by a series of what they call Y's and switches. The passengers and freight pass over these grades, two cars at a time. The engineering on this road is regarded as the boldest that has ever been attempted.

* See next page for Table.

'List of Tunnels upon the Baltimore and Ohio Railroad, from Baltimore to Wheeling — 380 miles.

Name of Tunnel.	Distance from Balt. in miles.	Length in feet.	Price per cubic yd.	Character of Rock.	Remarks.
Kelley's Tunnel, .	26	400	$3 87½	Mica slate.	Requires no arching.
Harper's Ferry, . .	84	80	3 00	Hornblend slate.	Do. do.
Doe Gulley, . .	142	1200	3 40	Blue clay slate, somewhat siliceous.	Arched with brick 14 inches thick.
Paw Paw, ...	159	250	3 19	Yellow and brown clay slate.	Do. do. 18 do. do.
Everett's	211	300	2 00	Sandstone in bottom. Fine clay and coal above, with sandstone roof.	Arched in part with 18 brick vault.
McGuire's, . . .	244	500	2 60	Blue clay slate with silicious veins.	Timbered, and to be arched with brick.
Rodeman's, . . .	247	400	2 20	Do. do. do.	Do. do. do.
Kingwood, 3 shafts	261	4100	3 00	Do. do. do. with limestone roof in part.	Do. do. do.
180 feet deep, .		shafts.	5 50		Shafts 10 x 15 feet sunk at side of tunnel.
Murray's, . . .	263	250	2 80	Light grey sandstone.	May require a short piece of arch at west end
Glover's Gap, . .	331	370	2 75	Blue clay slate with edge of sandstone.	Timbered, and to be arched with brick.
Sole's, ...	337	112	2 25	Hard grey slate with siliceous nodules.	May require brick arch, although timbered only at west end.
Eaton's, ...	338	300	1 81	Grey siliceous slate.	Short arch at west portal.
Martin's, ...	339	180	1 75	Soft blue and yellow slate.	Driven 16 feet wide only and 35 feet high.
Broad Tree Tunnel,	342	2350	2 75	Blue clay slate with some siliceous veins.	Timbered, and will require arching throughout.
3 shafts 160 ft. deep.	10x15	shafts.	5 00		
Welling, do. . .	351	1250	2 25	Do. do. do.	Do. do. do.
Shepherd's, . . .	361	400	1 95	Soft clay slate of blueish color, with heavy sandstone roof.	Will require no support to roof, but must be walled up on the sides.

The prices of rock excavation in open cuttings ranged from 33 cents up to 100 cents per cubic yard, not including the transportation price, which may average for distances over 400 or 500 feet about one cent per 100 feet. The lowest price applies to the soft yellow clay slates, and the highest to the granite rocks. The excavation price of the rock in the deep cuts at the portals of the tunnels was generally about from 50 to 60 cents on the road west of Cumberland, and 70 to 80 cents east of that place, where the rocks were harder.'

In going through the Kingwood tunnel, I stood upon the platform of the car, and noticed that the smoke and steam seemed to have an affinity for the sides of the rock. They formed a graceful curve, as the cars passed through. I questioned the parties in charge particularly about the smoke and steam, and was assured that the slightest difficulty had never been experienced from them.

On the Hempfield Road, 76 miles long, leading from Greensburg, Pa., on the great Pennsylvania Road, to Wheeling, there are seven tunnels now building. The length of each is, 2600, 1500, 1200, three of 700, and one of 300.

The assistant engineer who furnished these facts, remarks thus, 'You will perceive that in building roads in this part of the country, we do not care much for tunnels. The prices bid for these tunnels varied from $1.50 to $2.25 per cubic yard, for loose rock, and from $2.50 to $3.50 per cubic yard for solid rock. I have before me the original bid, (the only one in the office at present,) which was accepted, and contract entered into, for tunnel No. 3. It is as follows:— For loose rock, $2.30, and for solid rock, $2.30. You will perceive this bidder has, as it were, averaged his prices, making his bid for loose rock a little higher than usual, and his bid for solid rock a little lower. This contractor has now

been at work for nearly a year, has never exhibited any symptoms of abandoning his contract, and seems to be doing very well with it.' The City of Philadelphia have subscribed $750,000 in aid of this road.

On the Pennsylvania road, between Philadelphia and Pittsburg, there are 5 tunnels. The principal one is called the Alleghany Tunnel, 3750 feet in length, and is intended to supersede the planes and stationary engines in crossing the Alleghanies.

The Engineer in charge of it, Thos. Seabrook, Esq., writes as follows:—

'The excavation was commenced October 14, 1851, and we had daylight through, January 31, 1853, in 15½ months. We have three shafts for working our tunnel, but on account of the large quantity of water encountered, and inefficiency of the steam engines at first employed, the work was not driven from all these points; it would average from the beginning about four drift-ways. Our weekly workings in the headings would average 20 feet. We took down about one-third of the height in driving our headings, and left the remainder for taking up in the bottom. Our bottom forces will take up an average of about 25 feet per week; we work at seven different points.

As we have a descending grade through the whole of our tunnel of one foot per 100 feet, and the stratification is level, we encounter a variety of materials, among other things, a vein of coal five feet thick; this coal caused us a great deal of trouble, in consequence of the bad air which it produced between the middle and eastern shafts. We, however, by using powerful machines for forcing air into the tunnel, introduced a sufficient quantity to prevent the men from stopping work, in the close sultry weather of summer — working 8 hour shifts. In our tunnel, we, unfortunately for the Company, have a bad roof the greater part of the way, which will require arching; it also caused delays by falls, frequently stopping the miners several days at a time.

In the excavation of our tunnel, we pay two prices; for the heading, or first drift-way, $4 per cubic yard; this forms one-third of the excavation; for the remainder, we pay $2.80 per cubic yard, making an average of $3.20 per cubic yard. These prices will, I think, afford the contractor a small profit. These prices cover all expenses, timbering, &c., which have been very heavy.'

I will read an account of the tunnel now constructing under Cincinnati, by S. H. Goodin, Esq., President of the road. It is one mile and a half in length, 25 feet wide, and 20 feet high. It will accommodate eight railroads, and give them close proximity to the centre of the city.

Mr. Goodin says:—'I had my misgivings as to its practicability within a reasonable time, and with the means at the command of this Company — but its letting, which was advertised for, brought together at this point a body of men whose experience in such work, and whose confidence in their ability to perform it, developed by the terms upon which they offered to construct it, left no doubt of its entire practicability. Out of *forty-one bids* which were offered at the letting, a large proportion, and those generally from the most experienced tunnellers, offered to perform the work for less than $600,000. To the gentlemen, Messrs. Farrell & Dunham, to whom the contract was finally awarded, I may say that it was not so awarded because theirs was the lowest bid, but for the reputation enjoyed by them for skill and ability. We pay for the construction of this tunnel, the sum of $552,000. They stand bound in their contract to complete this work within 22 months from this day, and the Company have such assurances as to justify them beyond a doubt that it will be accomplished.'

On the Marietta and Cincinnati Road are three tunnels, and bids have been offered to make them at $3 per cubic yard.

There is a list of the Canals in England, in Cresy's Encyclopædia of Engineering, published in 1847, in which many facts are given respecting tunnels. The list embraces 125 canals, the length of which is rising 2,500 miles,

in which he names 54 tunnels, and gives the length, &c. of most of them. The Encyclopædia Americana names eight tunnels not embraced in Mr. Cresy's list, which makes the number recorded 62. The last named work states, that the Duke of Bridgewater's Canal, in traversing the Mountains of Worsley, 16 miles of it are under ground. I was informed by Mr. KNEASS, City Surveyor of Philadelphia, that he had passed through a tunnel on this canal, five miles long. The aggregate length of the tunnels for canals in England, is represented in Engineering Works, to be from 40 to 50 miles in length.

On the railroads in England, Mr. Cresy names 31 tunnels in 1847, and it is known that a large number have been made since.

The 'Annual of Scientific Discovery' for 1853, gives the following brief account of a tunnel in Hungary, 10 miles in length: — 'One of the longest, if not *the* longest tunnel in the world, is now in a forward state of completion. It is situated in Hungary and leads from the shores of the river Gran, not far from Zarnowitz, to the mines in the Schemmitzer hills; it is two geographical or about ten English miles long; it is intended to answer the double purpose of a channel to drain off the water accumulating in the works, and of a railway to transport the ore from the mines to the river.'

I am a director in the Sacket's Harbor and Saratoga Railroad, the route for which has been surveyed the last season, and the distance between the Atlantic at Boston, and Lake Ontario, by way of the tunnel, is 335 miles. The highest grade going east will be 35 feet, and west 52 feet, to the mile. The region traversed by this road within 30 or 40 miles of the Lake, embraces some of the finest and most productive land in New York. The road passes through what is called the 'Wilderness,' which abounds in timber of nearly all kinds, lakes, and running streams, and the land is well adapted for grazing.

I have a letter from Judge E. G. Merrick, of Clayton, N. Y., who is an extensive builder of steamboats, propellers, and sailing vessels, and owns the largest amount of tonnage in vessels of any person that navigates the Lakes, for which reason he is familiarly called the 'Billy Gray of the Lakes.' I asked Judge M. to visit Boston for the purpose of stating to the Committee the amount of business on the lakes, pressing to find an outlet to the Atlantic. He was unable to attend; but writes thus, under date of Feb. 19, 1853: — 'It appears to me it will be no very difficult matter to satisfy intelligent men that such a road as is contemplated would not want for business, and still more easy to satisfy them that no road built or to be built would do more for the interest of Boston than the continuous thoroughfare to which you alluded, viz.: Saratoga Railroad, and the roads connecting with it leading to Boston via the Hoosac Mountain.

By a statement of the receipts of flour at tide-water for the last 18 years, I find the increase is 4,200,000 barrels, being 5,300,000 in 1852
against 1,100,000 in 1835
The increase of 1852 over 1851 is 1,100,000.

These statements show that the increase of Western produce would furnish business for an additional railroad every year, allowing other products to increase in proportion to wheat and flour, and many of them do much faster. If Boston wishes to compete for this Western business, this is the channel through which she can do it.

That route which carries property the nearest to the Atlantic market by Lake vessels, and has the shortest railroad, must take the business. It is a route which would also compete successfully for the Emigrant travel.'"

Thursday, March 24.

MR. CLAPP recalled. — "A plan is now on foot for building an air-line road from Troy to Rochester, 202 miles long, passing to the south of the Mohawk Valley. It has been ascertained by instrumental examination that there will be no grade exceeding 38 feet; curves not to exceed $1\frac{1}{4}$ degrees for 100

feet; the general direction is close to the air line, the greatest departure being two miles; the bridging and masonry will be less than upon any road in the State of the same length, and 157 miles will be of ordinary cost. The saving in distance between Troy and Buffalo will be about 30 miles, and this route to New York from Buffalo will be about 25 miles shorter than by the Erie road. It traverses a rich and populous country, now destitute of railroad facilities.

The great central line through New York must of necessity continue to be *the* great thoroughfare between the Atlantic, and the Lake and Mississippi Valleys, for the reason that it avoids crossing the Alleghanies. To show this, I read an extract from the Report of the survey and estimate of the Mohawk Valley Railroad, E. H. Brodhead, Esq., Engineer, showing that 'the rise and fall on the route through the Valley of the Mohawk to Lake Erie, is 640 feet in a distance of 363 miles by canal. In the whole distance from Philadelphia to Pittsburg by way of railroad and canal, 394 miles, the rise and fall is 5,220 feet.'

The difference in the original cost of locks to overcome the rise and fall from Cleveland to Philadelphia, and the annual charges for the maintenance, when compared with the cost of the locks on the Erie Canal, shows a balance against the Pennsylvania route of $569,400 annually. When reduced to dollars and cents, this is the difference between the grades from Lake Erie to New York, through the Valley of the Mohawk, and from Lake Erie to Philadelphia, across the Alleghany mountains. All the routes from the Western Lakes to the Atlantic, south of New York, for a distance of 600 miles, must cross these mountains, and to a greater or less extent, encounter the obstacles which Pennsylvania has found so formidable. Whether these ascents and descents are overcome by lift locks in canals, or stationary or locomotive engines on railroads, it requires great additional expense in the outlay and in the current charges, and is a drawback as well on the owners of the canal or road, as on the persons using either, for transportation or travel. These routes, when completed, may do a large business; but the central route through the State of New York, from the advantages which nature has given it, will, if provided with ample accommodations, at cheap rates, maintain the supremacy which it has held amidst all its rivals for the last twenty years.

Since the canals and railroads at the North had been built, the tendency of freight from the Upper Mississippi has been to find an outlet to the Atlantic, *up stream*, instead of down the river to the Gulf of Mexico. In consequence of this, the tonnage and commerce of New Orleans has been seriously diminished. This has led the citizens of the Southwest to hold a railroad convention at New Orleans, with a view to encouraging the construction of roads to counteract this tendency. At this meeting a Report was made, giving a variety of statistics comparing the importations, from up the Mississippi, of their leading articles into New Orleans, and showing the amount for 1850 and 1851 to be much less than in 1848 and 1849." Mr. C. was proceeding to read these statistics, with the comments of the Committee thereon, when Mr. Phelps, Counsel for the Western Railroad, raised a question of order, as to the authenticity and relevancy of such facts, and they were ruled out by the Chairman of the Committee.

Cross-examined by Mr. Phelps. — "Am a Director of the Sackett's Harbor and Saratoga Railroad. The towns on the line of the road are large in area, but small in the number of inhabitants. The distance from Troy to Schenectady is 20¼ miles, from Schenectady to Albany is 17 miles. From Sackett's Harbor to Troy 170 to 180 miles. Engineers have been over the line and surveyed the route. The State of New York has given to this road 250,000 acres of land at the nominal price of five cents per acre, to aid in its construction, and individuals propose to give as much more. Do not know that the air-line road is

abandoned. Saw several of the parties interested in it at Troy last week, who seemed any thing but discouraged, and appeared quite alive to the subject.

Have heard that the new Mohawk Valley Railroad is suspended, in consequence of its opponents, or rivals, having obtained control by subscribing for a majority of the stock." *

JAMES HAYWARD. — "Am a Civil Engineer. From 1820 to 1827, was Instructor in Mathematics in Harvard University. Have been engaged in engineering and construction of railroads for twenty-six years — have surveyed many lines, built the Boston and Maine Railroad to Berwick, Maine, and located the Ogdensburg Railroad. Resided in Plainfield, near the Troy and Greenfield line, until I went to College — am acquainted with the country upon the tunnel route, and have crossed and examined the mountain when a student. Know its character. It consists of mica or talcose slate. Should it prove to be harder than slate, this would add only to the cost of drilling, and not to the cost of blasting or removing. An additional dollar per yard would cover the cost of mining in case the hardest rock should appear. I returned from Europe about eighteen months since — while there, made inquiries as to railroads, harbors and tunnels. Visited the Nerthe or Marseilles Tunnel, visited England, Belgium, Holland, France, Sardinia, Italy, passed through some thirty tunnels, became acquainted with some of the most eminent engineers, Brunel and Stevenson. I visited the Nerthe or Marseilles Tunnel, and procured a profile of the tunnel and shafts, which I now exhibit to the Committee. I saw Mr. Price, the contractor who made this tunnel, and he called the rock a hard limestone. The height of the hill above the tunnel was more than 600 feet. There were 24 shafts of $9\frac{10}{12}$ feet diameter, the longest of these was 610 feet deep and the aggregate depth of the 24 was 7589 feet; the deepest shaft cost $73 per yard down. The entire cost of the 24 shafts including masonry was about $150,000. The entire tunnel cost the contractor £25, or $125 per lineal yard for mining; this mining included the shafts which are not included in the lineal measure. The cost of masonry for this tunnel was $423,000. The entire length of this tunnel was 15,000 feet or about three miles, and the rock required a lining of masonry. The whole cost to the company for excavating this tunnel was $705,000. It cost the contractor less. The rock of the Hoosac would come out better than that of the Nerthe. The area of the Nerthe tunnel is 50 per cent. greater than that of the Hoosac, and there were more cubic yards in the excavation of the Nerthe than it is proposed to take from the Hoosac. I passed through this tunnel, there was no inconvenience from smoke or steam. In some of the tunnels in England the height is but 14 feet and the width but 10 feet; in these it is necessary to close the windows when you pass through a tunnel, but in the larger tunnels the tunnel clears itself immediately after the passing of a train. In building the Nerthe tunnel the bricks were made from poor material, and loss was thus incurred. In Europe laborers work for less than in this country, but good workmen get as much, and officials more. Engineers get much higher salaries, and work costs as much. Engineers get as many pounds in Europe as they get dollars in America. The contractor for the Nerthe Tunnel was Mr. Price, an Englishman, whom I took pains to see, and he employed Englishmen. This tunnel did not take more than five years to finish, and may have taken less time; I did not ascertain the precise time.

I passed through the Woodhead Tunnel on the Sheffield and Manchester Railroad in England, through the backbone of England. It bears a more close resemblance to the Hoosac Tunnel than any other I have seen. Its length is a little over three miles; it had five shafts from 400 to 600 feet in depth, and they were rather larger than it is customary to make them. It is through stone, a granitic rock; they call it the millstone grit. The cost of this tunnel

* See page 77 for Mr. Farwell's testimony, omitted in place by mistake.

was $1,026,705. The length of time about five years, the company was short of funds. General Pasley examined this tunnel while in progress, and was drawn out through a shaft of 540 feet depth. I experienced no difficulty in passing through this tunnel; the cars were lighted by lamps. The general plan now is, to close up the shafts after a tunnel is finished; they are not required for ventilation, for the tunnel ventilates itself. There is no difficulty in ventilating by pipes while the tunnel is in progress, it is easily done; and were ventilation necessary in a long tunnel, it could easily be effected as in mines by a furnace under one of the shafts, which might be kept open for the purpose; a reflector lamp placed in the front part of the engine; such as are used at night on engines, would effectually light the tunnel.

In Cornwall there are very extensive coal and copper mines, and there are adits or tunnels nearly thirty miles in length; there are also nearly thirty miles of tunnelling connected with the Duke of Bridgewater's Canal.

The Thames and Medway Tunnel, between Gravesend and Chatham, England, about $2\frac{1}{4}$ miles long is 39 feet by 30 feet. This tunnel contains as many cubic yards as the Hoosac Tunnel; only one shaft has been left open on this tunnel. It is used for a canal, and for a railway. When General Pasley a Government officer examined it, he went through with a party carrying torches, passed a day in the tunnel, and they were not incommoded by the smoke or steam of trains passing half hourly in each direction. The smoke and steam cling to the roof and are condensed. This was begun in 1819 and opened in 1824. The Hoosac when constructed would ventilate itself.

The Box Tunnel is of unusual size, 39 feet high and 32 to 33 wide — it is 9579 feet in length, and its shafts were 25 feet in diameter. It is on the Great Western Railroad whose Engineer, Mr. Brunel, was somewhat expensive. I had several conversations about the Box Tunnel with Mr. Marchant, the Assistant Engineer, who constructed it. For 2700 feet of the distance, it went through a hard oolite rock. I described the Hoosac and its rock to Mr. Marchant, and he estimated the cost of constructing a tunnel at the Hoosac, at $1.75 to $2 per cubic yard. I described the Hoosac rock to him as a hard slate. The tunnelling in England is more difficult than in this case, on account of the position of the broken strata, and much of it is rendered very expensive because it is in soft, soapy clay that presses in above, below, and at the sides, and renders it difficult to get foundations, and requires arching beneath and around the whole area. This is the case with the Blechingly, Saltwood, and Chipping Camden Tunnels. There is a project to tunnel the Alps between Chamberry and Turin, and I have the report of Mr. Maus the Engineer. He made the Belgian Tunnels, and is at the head of the profession on the continent. I saw Mr. Stevenson, the most distinguished Engineer of England, on this subject, who had just returned from an examination of this project. He is the first Engineer in the world. He said he had approved the plan of Mr. Maus. This was in 1850. The mountain is about 5000 feet above the line of this tunnel, the length $7\frac{2}{3}$ miles. Mr. Maus proposes to make this without shafts and by a machine. He works the machine by water power. The grade will be 105 feet to the mile after the tunnel is finished. Mr. Stevenson expressed a belief in the success of the machine. It cuts the rock into squares and they are split out. Mr. Maus says with confidence, he can accomplish this enterprise in five years.

The Box and Blechingly Tunnels are the most costly in their construction.

I visited the Engineer of the Uppingham Tunnel, one quarter of a mile in length. It cost there by contract lined with masonry throughout, £25 per running yard. At this rate the Hoosac Tunnel would cost $1,807,000. At the rate which the Chipping Camden Tunnel cost, the Hoosac would cost $1,854,876.

The Pulpit Rock Tunnel on the Reading Railroad cost $66.20 per lineal foot; at that rate the Hoosac Tunnel would cost $1,595,000. The total cost of the Woodhead Tunnel, three miles long, was $1,026,000. At this rate the Hoosac would cost but $1,556,000.

Loammi Baldwin, a master of our profession, made the report I now hold in my hand, on the Hoosac Tunnel. General Bernard, then at the head of our Engineer Department, gave him $3 per cubic yard as an estimate for the Hoosac Tunnel. Mr. Baldwin procured the average cost of five tunnels, which he found to be $3 per cubic yard. At the highest cost of the five, the Hoosac Tunnel would cost $1,706,922. At Baldwin's estimate it would cost $920,830. I think the estimate of Mr. Edwards will be sufficient for the Hoosac Tunnel. I think two millions of dollars will be *ample* to tunnel the Hoosac, — it leaves *a large margin.*

I have a list of sixteen tunnels on the Baltimore and Ohio Railroad, and the average cost of mining these was $2.60 per cubic yard; the cost of shafts about $5 per cubic yard. I should think this tunnel with forty miles of railroad would be good security to the State for a loan of two millions. I have been through the valley of the Hoosac. That valley and the upper valley of the Hudson are rich in resources, and in my mind offer strong inducements to construct the railroad.

As respects construction, the level in all the sections of the tunnel can be easily kept, and with proper care there will be no difficulty in making the sections meet. I have known an instance where sections meeting did not vary in the level; the sides varied $1\frac{1}{4}$ inches."

Cross-examined by Mr. Phelps, for the Western Railroad. — "I have made no long tunnels. I constructed one short one for the Boston and Maine Railroad, but 150 feet long. Mr. Marchant advises putting the drift of a tunnel at the bottom. It is not always put at the bottom. I do not know particulars as to Newton Tunnel.

I think there would be no trouble with water in the Hoosac Tunnel. Cost is liable to exceed estimates. I think the cost of a tunnel can be ascertained in advance as nearly as a railroad's cost. There is no uncertain item like land damages, and on a railroad much is often done not originally contemplated."

Direct examination resumed. —" Cost sometimes falls short of estimates; on an English line the cost of one tunnel fell greatly below estimates; on the Blechingly Tunnel the contractor made a profit on part of the work, having received forty eight per cent. more than the actual cost. The engineer dried his bricks in winter by the fire. In English tunnels they usually advance from the outer faces from each face forward *at least* twenty feet per week, and *at least* fifteen feet per week from each face in each shaft, and the heading should be driven from forty to sixty feet per week.

On the Blechingly Tunnel on the South-Eastern Railway, 1324 yards long, the shafts were sunk at the rate of $1\frac{2}{10}$ yards per day, or $3\frac{6}{10}$ feet. The shafts in England are worked at the rate of 1 to $3\frac{1}{2}$ feet per day. I should think that not more than three shafts are necessary in the Hoosac Tunnel."

Cross-examination resumed. — "I know Mr. Felton and Mr. Lee, they have a good reputation as engineers."

Friday, March 25.

The Committee resumed the hearing, and JAMES HAYWARD was recalled and testified. — " To be more precise, I have reduced to writing a part of my evidence, as follows: —

The Nerthe Tunnel, near Marseilles, in France, is 15,153 feet in length; $26\frac{1}{4}$ feet wide, and $29\frac{1}{2}$ feet high, in the clear. It has 24 shafts of the aggregate depth of 7,589 feet. The deepest is 610 feet. They are lined with masonry, and are 9 feet, 10 inches [3 metres] inside the lining.

The body of the tunnel is partly lined with brick work, three bricks thick, partly of two bricks thick, and partly with a *one brick* arch overhead merely, — and partly is without any lining.

The cost of mining the tunnel proper, (as stated to me by the Engineer having charge of the work,) was $139.76½ per lineal yard. The actual cost to the contractor of mining the whole tunnel, including the shafts, was about $125 per yard forward, not counting the yards of shafting.

Besides the above, there is a semicircular brick aqueduct about 4½ feet in diameter, extending through the whole length of the tunnel. I have not the cost of this part of the work, but, in this estimate, I put it down at the cost of a similar one on the Blechingly Tunnel in England = 8s. 5½d sterling, which I call $2.10 per yard forward.

Mining the body of the tunnel at the price stated by the Engineer,	$705,982.20
Mining shafts, as per Engineer's statement . . .	109,081.08
Masonry for lining the shafts, ...	49,069.31
Lining the body of the tunnel	423,711.18½
	1,285,843.77½
To which add aqueduct, ...	10,607.10
Whole cost of these items, by Engineer, . . .	1,298,450.87½
Total cost as per contractor's statement, . . .	1,114,763.01½
Giving him a profit of	$183,687.86

At the same cost per running yard, as that of the Engineer's statement, for the Nerthe Tunnel, the Hoosac Tunnel would cost $2,065,113.58. At the price stated by the contractor, the Hoosac will cost $1,772,968.30.

As the Hoosac Tunnel is not more than two thirds the Nerthe in sectional area, it would seem proper to deduct 33⅓ per cent. from the last mentioned prices. But deducting only 25 per cent., it would give the cost of the Hoosac, at the engineer's prices, $1,558,835.19. And according to cost of the Nerthe Tunnel, as stated by the contractor, $1,329,726.23.

I do not apprehend there would be greater difficulty in the Hoosac than in the Nerthe Tunnel. I think it would be less difficult."

Cross-examination resumed. — "I did not go out to Europe for the Vermont and Massachusetts Railroad Company, or for the Fitchburg Company. I was about a week at Marseilles, about three months in England. I visited the Thames Tunnel; I went out of my way to see Mr. Price, who made the Nerthe Tunnel. I went into a tunnel in progress near Dorchester, and another near Liverpool, 1¼ miles long, and walked through. The time in which a shaft can be sunk is 1 to 3½ feet per day, perpendicular. I have not been to the mountain since the machine was placed there. The soil in England is more unfavorable for tunnels than here. There is no more uncertainty as to tunnels than railroads. The portion I estimated for on the Boston and Maine did not differ materially from estimate in actual cost."

Mr. Derby then called H. G. Knight, who testified.—"I am a resident in Boston, have for twenty-five or thirty years pursued the business of a machinist, and invented the steam pile-driver. Have invented a stone-drilling machine, the model of which I now present to the Committee. It will drill a foot an hour in granite, a seven-inch hole, and will drill twelve feet per day. Have operated in Roxbury, at the ledge on Warren street, also at Lewiston, Maine, where we took out 10,000 to 25,000 cubic yards of rock. Took the machine to the Valley Railroad, Pennsylvania, where it saved many thousand dollars. Have been to Pottsville, Pennsylvania, and seen the works of Magennis. At these works they were making a shaft of 14 feet by 18 feet, and had gone down about 160 feet.

The rock here was very hard, harder than granite, and the workmen while I was there sunk the shaft at the rate of one foot in eight hours, or three feet per twenty-four hours. There were three sets of men employed. They were troubled with water. This was two months ago. Have sent a machine to Pottsville which will sink a shaft six feet per day. Have been at the Hoosac, the rock there is much softer, tried it with the hand-drill. Could drill there thirty or forty feet without sharpening the drill. Could work in a shaft at Hoosac twice as fast as at Pottsville. Should put an engine upon the ground at one side of the shaft, and work the pump, and lift the rock, and drill with the same engine. Can work any number of drills at a time, and at any reasonable depth ; each requires three or four horse power, and as the shaft sinks, wooden or iron rods can be attached to the drills. In eight hours we can drill three or four feet. Could do more than five or six feet per day.

Have drilled Artesian wells with this machine, and once drilled through an iron ball dropped into such well. The drilling machine is the property of a company. J. C. Dunn, late City Treasurer, of Boston, Ex-Alderman Preston, and Mr. Whiting, now Alderman, are members.

We have sent one to cut the canal for Mr. Bryant, at Niagara Falls, one to Steubenville, one for the Ohio and Pittsburg Railroad, two to the North River, one to Albany, and two or three to California. More are wanted. A steam drill will do the work of ten men."

Cross-examined by Mr. Phelps. — " I sent this model to the Committee two years since. This was used on the Boston Waterworks three months before their completion. Drill cuts twelve feet a day ; one of the cuts made by it was half to three fourths of a mile in length. Have sold six or eight since 1849."

Mr. Derby then called Henry Goulding, who testified — " I reside in Boston, am a mechanic ; have a machine for drilling horizontally ; am now building a smaller one ; the larger drilled in 17 minutes, 20 inches ; am sure the second machine will be successful ; use a four-horse engine. Work at No. 2, Andover street, Boston. Have been at the Hoosac. The work is softer than that drilled at Somerville. Have had a Committee of five to see my drill, who said they were satisfied."

Cross-examined.—" Built my first machine one and a half year since. Worked at Somerville only ; some holes were five, and some six feet deep."

Mr. Derby then called John A. Carpenter, who testified — " I am a railroad contractor ; have been one of the firms of Belknap, Gilmore & Company, and Gilmore & Company. Have followed the business since 1834. Our firms have built more that 400 miles of railroad. We have built, also, the Essex Dam at Lawrence, and the foundations at the Bay State Mills. There were 70,000 perch of stone used on the last, and 120,000 to 125,000 perch in the two enterprises. A perch is two feet less than a yard, say 25 feet. I have made all the tunnels of Massachusetts, viz : the tunnels at Salem and Newburyport. These were open cuts, arched. We have contracted for two tunnels, of 300 feet each, on the Troy and Greenfield line ; are to be paid $3 per cubic yard, of which fifty per cent. is to be cash, twenty-five per cent. bonds, and twenty-five per cent. stock. Have quarried the mica slate in open cuts, at $1 per cubic yard, seventy-cents cash, and twenty-five cents bonds. We have offered to put this tunnel through in five years, for $4.50 per cubic yard, estimating work at 361,500 cubic yards. This price for the tunnel was to include shafting and incidental expenses. The work was to be done under our offer, in five years, and we hoped to make a profit at this rate."

Cross-examined by Mr Phelps. — " Since 1845 Gilmore and Carpenter have composed the firm, we were interested with others in constructing the Worcester and Nashua, Northern, Passumpsic, and other lines. I was at Lawrence, and my partner on the railroad work. The Salem tunnel was 700 feet long, resting

on quicksand, much water running in. Deepest cut, 25 feet; average, 22 feet. The Newburyport tunnel was through gravel; deepest cut, 44 feet; an open cut. Nearly seven miles of the Troy and Greenfield Railroad are graded."

Mr. DERBY then called Dr. JOSEPH C. BATCHELDER, who said: "In contracting for the machine, the owners agreed to expend a considerable sum, and when we reached the mountain with the machine, in August last, we had exceeded that sum. The present position of the machine is one for experiment only, as the cut has not yet reached the mouth of the tunnel. I have the utmost confidence in its success. It requires some trifling alterations in substituting heavier rails for the track, and wrought-iron holders for the cutters for cast-iron, and as we advance we can have better means for bracing."

Cross-examined by Mr. PHELPS. — "The Troy and Greenfield Railroad Company have advanced $1200; the first payment a few weeks since, the last just before the visit of the Committee. We begun to send up the machine in May. The day we started it, it cut three inches. In cutting three and one-half feet, had completed half of circle, soon after, entire circle. It took us one week, this winter, to put machine in order for operation. We have worked centre drill but but not blasted from it, but from the bottom. The roof is about 5 feet thick, part blown off by heavy blast. There will be no difficulty after advancing into the mountain. I am confident machine will proceed 6 to 7 feet per day. The whole cost of machine was $25,000."

Mr. DERBY then recalled A. F. EDWARDS, Engineer of the Troy and Greenfield Railroad Company, who verified the following tables, prepared by him, as to elevations, grades, curvatures and distances.

Table of Distances by Railroad, from the Union Railroad Depot, at Troy, to the principal cities and manufacturing towns of New England.

Towns.	Via Western Railroad.	Via Troy and Greenf.	Via Rutland.	Remarks. Distance saved independent of grade in favor of Tunnel Route.
	Miles.	Miles.	Miles.	
Boston,	208	186	249	22 and 63
Groton Junction,	192	151	214	41 " 63
Lowell,	209	168	231	41 " 63
Nashua,	209	168	231	41 " 63
Manchester,	226	185	248	41 " 63
Concord,	244	203	266	41 " 63
Lawrence,	222	181	244	41 " 63
Salem,	224	192	255	32 " 63
Newburyport,	242	201	264	41 " 63
Portsmouth,	259	218	281	41 " 63
Haverhill,	229	188	251	41 " 63
Exeter,	246	205	268	41 " 63
Dover,	264	223	286	41 " 63
Saco,	294	253	316	41 " 63
Portland,	307	266	329	41 " 63
Fitchburg,	190	136	199	54 " 63
Ashburnham,	191	126	189	65 " 63
Greenfield,	146	81	—	65 " —
Brattleboro',	170	105	159	65 " 54
Myrick's Crossing,	250	228	291	22 " 63
Middleboro',	244	220	283	22 " 63
N. Adams,	78	48	—	30 " —
N. Braintree,	218	196	259	22 " 63

Distances from place to place below noted by the routes named in the margin.

		Miles.	
From Saratoga,	to Boston,	185	Via Hoosac Tunnel.
" "	" N. York.	184	" Hudson River R. R.
" "	" "	193	" Harlem R. R.
" "	" Boston.	230	" Rutland.
" "	" "	239	" Western R. R.
" Sacket's Harbor,	" "	335	" Saratoga and Ho'c. Tunnel.
" " "	" "	420	" Rutland.
" " "	" "	474	" Ogdensburg.
" Kingston, Canada West.	" "	353	" Saratoga and Ho'c. Tunnel.
" " " "	" "	468	" Ogdensburg.
" " " "	" N. York.	368	" Rome and Mohawk Valley.

Comparison of Western Railroad from Hudson River Ferry, at Greenbush, to the Connecticut River at Springfield, with the Troy and Greenfield Railroad, (or Tunnel Route,) from the Hudson River Bridge, at Troy, to the Connecticut River, at Greenfield.

Distance by Western Railroad, ... 102 miles.
" " Troy and Greenfield Railroad, (Tunnel,) . . . 82 "

Deflection by the Western Railroad, ... 5664°
" " " Troy and Greenfield Railroad, (Tunnel) . 3142°

Western Railroad more than Troy and Greenfield, . . 2522°
which is equal to seven entire circles more than the Troy and Greenfield.

By the Western Railroad the shortest Rad. of curvature is . 822 feet.
" " Troy and Greenfield Railroad, ... 1228 "

Elevation by the Western Railroad. Total rise and fall, . 3420 feet.
" " " Troy and Greenfield Railroad, . . . 1598 "

By Western R. R. more than the Troy and Greenfield R. R., . 1822 "
or, by the Western Railroad the rise and fall is double that on the Troy and Greenfield Railroad, and 224 feet in addition.

Maximum Grade on Western Railroad, . . . 83 feet per mile.
" " " Troy and Greenfield Railroad, (Tunnel Route, $31\frac{68}{100}$ in Massachusetts, $26\frac{4}{10}$ in Vermont and $39\frac{6}{10}$ in New York. The Grade of the Western Railroad at the State line of New York is 50 feet *higher* than the *Summit Grade* of the Troy and Greenfield Railroad, or Tunnel Route).

From the report of Wm. J. McAlpine, State Engineer and Surveyor — see Assembly Doc. No. 10, Jan. 4th, 1853 — giving the average cost in operating thirty railroads, in aggregate length $1901\frac{3}{4}$ miles, of the transportation of one passenger one mile; also, freight one mile; also, the cost of freight and passengers moved one mile on six of the principal Railroads.

Railroads.	Passengers one mile.	Freight one mile.
Average of thirty Railroads, .	$4\frac{62}{100}$ mills.	$7\frac{81}{100}$ mills.
Albany and Schenectady, with its high grades, . .	$6\frac{6}{10}$ "	$1\frac{66}{100}$ cts.
Schenectady and Utica, .	$2\frac{6}{10}$ "	$4\frac{9}{10}$ mills.
Utica and Syracuse, . .	$3\frac{2}{10}$ "	$7\frac{4}{10}$ "
Syracuse and Rochester, .	$4\frac{3}{10}$ "	$5\frac{4}{10}$ "
Rochester and Buffalo, . .	$3\frac{3}{10}$ "	$8\frac{3}{10}$ "
New York and Erie, . .	$4\frac{3}{10}$ "	$6\frac{6}{10}$ "
Average of the six Railroads, .	$4\frac{5}{100}$ "	$8\frac{2}{10}$ "

Taken from page 32 of the report of the Western Railroad, by WILLIAM GIBBS MCNEILL, GEORGE W. WHISTLER, WILLIAM H. SWIFT, Engineers.

Level.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
—	10	20	30	40	50	60	70	80	90	100
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons
260.00	173.58	128.95	101.87	83.60	70.04	60.53	52.83	46.60	41.50	37.25

"The above table is based on a calculation of an Engine weighing ten tons, and capable of propelling a load of 260 tons, Tender included, on a level, (the Rails being in the best state of adhesion, $\frac{1}{6}$.) When the Rails are wet, or frosty, the adhesion may be diminished to $\frac{1}{20}$; the load in this case is also diminished in the ratio of $\frac{1}{6}$ to $\frac{1}{20}$; or upon a level, the load would be but 78 tons; on 50 feet per mile 16.21 tons; and on 100 feet do., 5.40 tons."

The following is based on a twenty-ton Engine, two pairs of drivers; weight on drivers 14 tons, 3136 lbs. Tender to same, 14 tons. The friction or traction=8.5 lbs. per ton, gross load. Adhesion $\frac{1}{6}$ weight on drivers.

Level.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
—	10	20	30	35	40	45	50	60	70	80
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
600.90	389.27	283.45	219.99	196.87	177.63	161.35	147.40	124.72	107.09	92.98

It, therefore, appears to draw a load up a plane of 20 feet to the mile, requires double the power needed to draw it on a level, but the Engine will not draw half the freight up such an ascent that it would on a level; as the resistance from the gravitation of the Engine and Tender must be deducted from the power that was available on the level to draw the same.

Comparative view of the Western Railroad, extending from the Hudson River *Ferry* at Greenbush to the Connecticut River at Springfield, and the Tunnel Route, extending from Hudson River *Bridge* at Troy to the Connecticut River at Deerfield.

Statement.	Western Railroad.	Tunnel Route.	Difference.
Distance by the chain,	102 miles.	82 miles.	20 miles.
Total deflection in degrees,	5664°	3142°	2522°
" rise going East,	1732 feet.	897 feet.	835 feet.
" " " West.	1688 "	701 "	987 "
Maximum Grade in Mass.,	83 "	31.68 "	51 "
Equated distance going East,	188.6 miles.	126.85 miles.	61.75 miles.
" " " West,	186.4 "	117 "	69.40 "
Average going East and West,	187.5 "	121.92 "	65.58 "

The above equations are made at 20 feet to the mile, instead of 19 to the mile, as by the Western Railroad. ("This being about the slope which requires double the power that is required upon a level.") "The equated distance is *the measure* of the *cost* of *transportation* (and is perpetual). Again, the *tolls* being measured, not by the equated, but by the actual distance, the receipts would be in the ratio to the length." See report of W. H. Swift, George W. Whistler and Wm. Gibbs McNeill to Western Railroad, page 56, dated Worcester, Jan. 15, 1837. Thus, it will be seen, the effect of this is that the *cost* of transportation would be $53\frac{8}{10}$ per cent. *more* on the Western Railroad than on the Tunnel Route, and the *toll* $24\frac{4}{10}$ per cent. *less* on the Tunnel Route than the Western Railroad.

Mr. DERBY then put into the case, the Reports of the Railroad Engineer of the State of New York, for January 1853: The Reports of the Troy and Boston Railroad Co., for 1851 and 1852: The Reports of Worcester Railroad Co. to the State and Stockholders, from the completion to the present time: The Prospectus of Lebanon Springs Railroad Co.: The Reports of Engineers of the Western Railroad in 1836, 1838, and 1840: The Reports of Reading Railroad Co. for 1851 and 1852: Report of the Joint Special Committee, of Massachusetts Legislature, 1851, granting loan for the tunnel.

Thereupon the Committee adjourned to Monday, March 28th, at 3 o'clock, P. M.

The meeting was appointed to be held in the Senate Chamber, on Monday, March 28, but in consequence of the illness of Mr. Phelps, Counsel for the Western Railroad, it was adjourned until Tuesday, March 29th, at half past 3 o'clock. At the opening of the meeting, Mr. Fairbanks, in behalf of the Western Railroad, stated that Capt. Swift was necessarily absent from the city, and that he, (Fairbanks,) had received a telegraphic despatch, informing him that the physician had forbidden Mr. Phelps to leave his room. For these reasons, he submitted to the Committee that the case should not go on to-day.

Mr. DERBY urged the importance of proceeding with the case, for the reason that the session of the Legislature was drawing to a close; that next week was a broken week, and that a postponement of the hearing would, in all probability, prevent the case from coming before the Legislature until towards the last days of the session. He thought the Western Railroad should be ready with other counsel, since it was not so much their province to make out a case themselves, as to cross-examine the witnesses of the Memorialists, with whom the burden of proof lay. Considering the importance of the case, he hoped the Committee would proceed.

Several of the Committee expressed their opinion that the hearing should go on without any unnecessary delay, and it was voted, on motion of Mr. Livermore, of Cambridge, that when the Committee adjourn, it be to meet on Thursday afternoon at 3½ o'clock, and that the Chairman notify the Western Railroad that the Committee would proceed at that time with the investigation of the case before them.

Mr. DERBY then asked permission to introduce one witness, who had waited some days to testify, and was obliged to return to New York. The Committee assenting, he called S. F. JOHNSON, Civil Engineer, resident in Troy, and at present Superintendent of the Troy and Boston road. Mr. Johnson submitted the following Table, prepared by him from the official railroad reports of the State of New York, and a portion of it from the Report of the Western Railroad, to the Stockholders, January, 1853.

"TABLE of Tonnage arriving and departing from Hudson River on New York Calans and Railways — 1851 and 1852:

	1851.	1852.
Number of tons arriving at tide-water by all the Canals,	1,977,151	2,254,822
Do. tons going from tide-water by all the Canals,	469,961	521,527
Aggregate by Canals,	2,447,112	2,756,349
Number of tons carried by Railways terminating at tide-water, viz: —		
Tons transported by N. Y. & Erie Railroad,	250,096	456,460
Tons transported by Albany & Schenectady,	92,058	162,178
Tons transported by Rensellaer & Saratoga,	27,194	50,215
Tons transported by Schenectady & Troy,	15,898	32,080
	2,832,358	3,457,282
Annual increase,		624,924

Number of tons transported by Western Railroad between Boston and Albany,	60,788	59,375
Total through tonnage Western Railroad going East and West,	1847	100,000
	1848	74,475
	1849	72,439
	1850	73,290
	1851	60,788
	1852	59,375

TABLE of Passengers annually transported by New York Railways running North and West and terminating at the Hudson River:

	1851.	1852.
Number of passengers annually transported by Albany & Schenectady Railroad,	303,045	413,154
Rensellaer & Saratoga R. R.	178,740	190,083
Schenectady & Troy, "	70,473	87,566
New York & Erie, "	688,789	864,330
	1,241,047	1,555,133
Annual increase,		314,086

Number of Passengers, 1st and 2d class, between Albany and Boston, transported by Western Railroad:

1843	26,595	1848	33,731
1844	21,330	1849	33,751
1845	19,192	1850	34,319
1846	29 852	1851	33,971
1847	34,299	1852	35,433

Mr. Johnson continued his testimony. — " The smallest curve on the Boston and Troy road is 2,865 feet. This is between Troy and Vermont line. The actual length of the road from the Union Depot to the Vermont State Line is $34\frac{3}{4}$ miles. The Hudson River Railroad, running in competition with that stream, carries large quantities of freight, both in summer and winter, such as grain, iron, produce and other bulky articles. Cars from the North, pass through Troy without being unloaded, to New York. They come from Lake Champlain and all points. This is done every day. The Hudson River road has miles of freight cars, some hundred. They have, according to the official report, *four hundred and forty-seven* long freight cars. There have been delays and difficulties in crossing the Hudson, at Albany. Very often they have been obliged to come up the river to Troy, cross the river and descend to Albany. This occurs very frequently in the Spring, Fall and mid Winter, to the great disarrangement of business.

There is no grade on the Troy and Boston road over $39\frac{3}{10}$ feet to a mile."

At this point Mr. Derby submitted to the Committee the following extracts from the Annual Report of the State Engineer and Surveyor on the canals of New York, for 1852.

Assembly Document, 1853, *No.* 28 — *Pages* 53 to 55.

" The dividing line of trade between Pennsylvania and New York canals, is 46 miles north of Beaver and Portsmouth, and 12 miles north of Cincinnati and Evansville; but when the enlargement of the Erie Canal is completed, the dividing line of trade, in accordance with the same principles, will be extended to the Ohio, and for a distance of 30 miles up the river from Beaver, (say Pittsburg,) and embrace all the Ohio river below that point, until it is intercepted by the trade which will descend to New Orleans.

The dividing line between the Virginia and New York Canal, when the former, and the enlargement of the Erie Canal are completed, will be 110 miles north of Portsmouth and Cincinnati.

The dividing of trade between New Orleans and the New York Canals, is now above the mouth of the Illinois river, but when the Erie Canal is enlarged, it will be extended to the Mississippi, at least as far down as St. Louis. The completion and enlargement of the Erie Canal will reduce the expense of transportation about 75 cents per ton, which is equivalent to extending the area of its drainage of trade 250 miles on a river similar to the Ohio, 150 miles on an ordinary canal, 50 miles on a railroad, and 5 to 7 miles on common roads, where these distances are not met by completing lines, and one half of those distances where they are so met.

The southern line of the trade drainage of New York Canal is about 1000 miles long; the increased area of this drainage, which would be caused by the enlargement, would be equal to one half of either of the North-Western States, and embrace a belt of the most productive lands in four of these States.

A reduction in the cost of transport through the Erie Canal, such as that which will be produced by its enlargement, will also increase the amount of trade within the present drainage, by permitting the exportation of many articles of large bulk and small value, which are restrained at the present time by the cost of transportation.

The whole area of the district, the trade of which concentrates at the eastern end of Lake Erie, is equal to 330,000 square miles. This Table shows that seven North-Western States and Canada West contain a population of over 6,000,000, an area of over 400,000 square miles, and that their annual agricultural and animal products exceed 15,000,000 of tons.

The commerce of the Western lakes alone, is now valued at over $300,000,000, and annually employs 80,000 tons of steam, and 140,000 tons of sail vessels.

The amount of flour and grain transported on the Lakes in 1851, was, of flour, 2,000,000 of barrels; of wheat, 8,000,000; of corn, 7,000,000; and of oats and barley, 2,000,000; making an aggregate of over 27,000,000 of bushels of cereal produce.

The whole exports of the same articles from the United States, in 1851, were but little more than half of the above amount.

The exports of the same articles from the city of New York, in each of the years 1851 and 1852, were about one third of that transported on the lakes.

The exports of flour and wheat from Canada, to and through Buffalo and Oswego, in 1850 and 1851, were:

In 1850 — Flour, 280,116 barrels; wheat, 1,160,445 bushels.

In 1851 — Flour, 270,735 barrels; wheat, 771,857 bushels.

The tolls received by the State of New York from Canadian produce, and the property passing through her canals, is estimated at over $300,000 annually.

The Ogdensburg Railroad has carried 97,395 tons through freight, eastward, and 18,813 tons westward, the last year."

The Committee, at five o'clock, adjourned, to meet at $3\frac{1}{2}$ o'clock, Thursday afternoon.

The evidence being closed, Mr. KEITH, in behalf of the petitioners, addressed the Committee in substance as follows: —

"Mr. Chairman and Gentlemen of the Committee: — I propose to relieve my senior associate of a small part of the labor of this case, by offering some suggestions mainly in reply to the memorial of the Western Railroad. It is now more than seven weeks since we first met for the purpose of presenting the grounds upon which the petitioners ask the aid of the State, for the construction of the Hoosac Tunnel. We then stated, what you have since had an opportunity of verifying, both by actual observation and by the uncontradicted testimony of unimpeachable witnesses, that the Troy and Greenfield Railroad is the only wanting link, to constitute, with the Fitchburg and the Vermont and Massachu-

setts roads in our own State, and the Troy and Boston road in New York, an entire new route of communication with the West — having an advantage over the only existing direct route in being some twenty miles shorter — in having only about one half the grade, one half the curvature, and in costing $4,000,000 less. We were then met by the Western Railroad, who informed us, by their counsel, that they had a remonstrance in preparation, and that it would be presented the next week. But for some reason it took them longer to load their battery than they had contemplated. We waited anxiously for their remonstrance for more than six weeks, for the manner with which it was announced, pretty plainly indicated that it was intended to demolish us utterly. Their battery has at length been discharged, their remonstrance, in other words, has been presented and referred to you. It has been printed, too, but not distributed, nor have we been furnished with a copy. But by great good fortune I succeeded, two days since, in obtaining a copy, the only remaining one in the office of the printer, of this rare and choicely preserved production. It is styled the 'Memorial of the Western Railroad,' &c., and contains twenty-five octavo pages. The points raised are few in number, and occupy but little space, but the misstatements, false constructions, and false deductions, are as many as could well be comprised in the number of pages.

I propose to read from, and comment upon, some of the prominent statements and arguments of this memorial. On page 3d they say, when the petitioners asked for an act of incorporation in 1848, a majority of the Committee reported against it, but the Legislature passed the bill reported by the minority. They neglect to state the significant fact, that this bill passed by overwhelming majorities of more than two to one in both branches, thereby overruling the report of the majority of the Committee, and furnishing the strongest possible evidence of the merits of the petitioners' case, and of the feasibility and importance of the construction of the Troy and Greenfield Railroad. Again upon the same page, and on the next succeeding page, they state that 'A want of confidence in the feasibility of the enterprise or in its value, as a paying investment, or some other cause, appears to have rendered abortive all attempts of the corporators to obtain the money necessary to construct their road. Capitalists have refused to invest in the enterprise, and under these circumstances they ask for aid.' This statement is undoubtedly made because it is thought to be prejudicial to our cause; and, for the sake of the argument, let us suppose it true; how then do we stand before the Legislature as compared with the Western Railroad, when they were petitioners for the aid of the State. Their charter was granted in 1833. In their first annual report, made June, 1836, on the 7th page, they say: — 'At the meeting *for the organization* of the Corporation, in January last, the stockholders instructed the Directors to apply to the Legislature for aid.' Thus it appears, by their own record, that the first breath breathed by the Western Railroad Corporation, the first cry uttered by them, was for the help of the State. That aid so humbly sought was generously accorded. The State first set the example of aiding the construction of important railroad enterprises, by subscribing $1,000,000 to the Western Railroad. But this did not last the Western Railroad long. In 1838 they are again in trouble, and cry piteously for help. In their report of that year, page 14, they say they have applied to the Legislature for a loan of credit, and hope it will be granted. They add, 'If they should be disappointed in this expectation, *they see no other course for the Corporation but to suspend the work, and close up the outstanding business.*' This is the language of the Western Railroad in 1838, after they had received $1,000,000, let it be borne in mind; and yet they hold out the fact that the petitioners are poor, and that capitalists are unwilling to invest in the petitioners' road, as a reason why the aid sought should not be granted.

Let us pursue this a little further; the $2,100,000 asked for by the Western

Railroad in 1838, was granted, enough, one would suppose, to satisfy their craving for a few years at least. But no, emboldened by the grant of 1838, they are before the Legislature again in 1839 for $1,500,000. They are not satisfied with the exertions of their directors, merely, but they hold a public meeting of their stockholders in Boston, and appoint a committee of *forty-seven* to aid the directors in their application to the Legislature for aid. This Committee issue an address. Listen to a paragraph from the fifth page of that address: '*Thanks to the enlightened public spirit of the Legislature of Massachusetts for* 1838, the Western Railroad — that great work which is destined to restore to our Commonwealth her wonted rank among the first States in the Union — has been progressing, *since the last session*, with unexampled rapidity and *the greatest economy.*" The greatest economy, mark gentlemen, the measure of that economy is an expenditure of $2,100,000 in ten months. It is then, by their own showing, the State that built their road, and not the stockholders; and yet it is the *fault* of these petitioners, that they are in the same position as the remonstrants allege that they were in during the whole time of the construction of their road. It is the *fault*, the *grievous sin* of the Troy and Greenfield Railroad, that they are poor, but it was the *pitiable misfortune* of the Western Railroad, that they could not take the first tottering step without the support of the right arm of the State! I will quote only one other passage from this address. 'Will Massachusetts deny herself the *pleasure and the advantage* of obtaining this great result' (the construction of the Western Railroad) 'as quickly as practicable? Will she allow herself to linger in the rear of this eventful age?' Mark you, gentlemen, the question of granting further aid to the Western road in 1839, was, merely, whether the State should deny herself the *pleasure* of giving or not! How different the question now. Now it is, whether *ruin and destruction* to the existing roads, and bankruptcy to the State, shall follow the granting $2,000,000 to tunnel the Hoosac Mountain, and bring our metropolis into immediate connection with the great West.

The additional aid asked for by the Western Railroad in 1839, to the amount of $1,200,000, was granted. In 1841, the Western Railroad again apply to the State for aid. They have another meeting of the stockholders, and this time appoint a committee of *sixty-five* to help the directors press the application upon the Legislature. I did not happen to be a member of the Legislature in 1841, but judging from the size of this Committee, I should suppose the number of lobby members during that session outnumbered the real members. This Committee issued an address, and I will read one paragraph from page 9th. 'The State is a stockholder in the Western road to the amount of one third of the stock. Our proposition, then, merely amounts to this; that our *senior partner*, to benefit himself, endorse the note of the firm, taking good collateral security.'

You see, gentlemen, that the Western road, from being the helpless infant nursed by the State in 1838, had, in 1841, become the junior partner of the State; and one would suppose from their present bearing, that in 1853 they had changed places with the State, and become themselves the *senior partner;* or rather that they had become the whole firm, and that the State is their apprentice to do their bidding. In 1839, they say that all they ask is the *trifle* of $2 to each inhabitant of the State, and they inquire in Roman text, '*Is there a man of common sense, who, bent upon a great purpose, will think of stopping, even for an instant, for such a trifle.*' It is just that trifle, gentlemen, of $2 for each inhabitant of the State, that the petitioners ask at your hands. The aid of the State was granted to the Western Railroad in 1841 to the amount of $700,000, making in all $5,000,000! furnished to enable them to complete their road. And this is the corporation that assume to say to the Legislature, you must not grant aid to another railroad project of momentous importance to the welfare of the State.

They say in their memorial, they did not appear before the Committee in 1851, when the petitioners came here for aid. Why did they not? Something, gentlemen, is due to modesty, and it is most charitable to suppose that they then felt, that it would not be quite delicate to oppose the granting to the petitioners of two-fifths of the amount granted them. But, gentlemen, two years work great changes, and the Western Railroad, since they became the whole firm, and the State their apprentice, come here and sneer at our poverty, and scout the prayer of our petition.

On page 4th of this Memorial, the Western Railroad say, 'An attempt to bore the mountain by a machine has apparently proved a failure.' Where did they learn that this machine had proved a failure? Did they get their information from those newspaper squibs so industriously circulated, (wholly without the knowledge of the Western Railroad of course,) during the last five months? or was the wish father to the thought?

You, Gentlemen, I am happy to say, saw that machine at the mountain, and examined its structure — at an unfavorable time it is true, when the thermometer was but a little above zero — the rock and machine full of frost — in consequence of which the workmen did not dare to tax the machine to its full power. Under such circumstances, I say, you saw the machine put in operation and cut an entire circle of twenty-four feet in diameter into the rock at the rate of more than 16 inches per hour. You saw that it was imperfectly braced, which will be completely remedied when it shall enter twenty feet into the tunnel proper. You were told also that the rails on which it rests were too light, and that the cutter-holders should be made of wrought-iron instead of cast-iron. These are mere details in operating the machine, easily perfected, and do not affect the principle upon which it acts in the slightest degree. And, Gentlemen, having seen the operations of this machine, and under the unfavorable circumstances stated, I appeal to you to know if any one of you, who saw what it accomplished doubts that it can tunnel the mountain much faster than it can be done by the old system of hand-drilling and blasting. But, Gentlemen, your judgment in regard to the success of that machine cannot fail to be strengthened by what you saw at the extensive stone-cutting establishment in New York. You there saw a number of machines operating on precisely the same principle, having the power in some cases applied horizontally and in others vertically, and in both instances with entire success. You saw with what facility the cutters cleaved off the red sandstone; and the workmen assured you that the mica slate that you showed them from the Hoosac Mountain was still easier to cut, because it contained less grit. You saw, too, that block of hard granitic rock, harder than the Quincy granite, placed upon the carriage for the action of the cutters — a block six feet four inches in length and eighteen inches in width. You saw, and have not yet forgotten how the block trembled as the cutters cleaved its surface, how the fire rolled and the chips flew during the short space of nine minutes, in which time a portion of the rock an inch and a half in thickness had been taken from the entire extent, and the whole reduced to a smooth surface. I cannot say how this exhibition affected your minds, Gentlemen, but from that moment I have not had a doubt of the ability of the machine to tunnel the mountain.

On the 6th page of this Memorial, for the purpose apparently of making their condition appear as desperate as possible, they say, 'With all its through and local business the Western road was not able to make a dividend to its stockholders before 1846, when it divided five per cent.; and since that time it has made one annual dividend of six per cent., four of eight per cent., and one for the past year of six and a half per cent.' Mark you, Gentlemen, this is the solemn representation of all the directors of the Western Railroad to you, to both branches of the Legislature and to the world. And first they say they were not able to make a dividend till 1846. Now what are the facts? I hold in my hand a copy

of the annual reports of the Railroad Corporations to the Legislature, made January 1845, being sworn reports of the various railroads for the year 1844. In the report of the Western Railroad, on page 115, there is this entry:

'*Since the 1st of January a dividend of three per cent. has been declared, which on 26,734 shares, (being all not owned by the Company,) amounts to* $80,212.' This report is signed by Hon. George Bliss, Josiah Stickney, one of the present directors, and all the rest of the directors at that time, and sworn to before Ellis Gray Loring, justice of the peace.

Here then we have one dividend at least before 1846. But let us look a little further. I hold in my hand a copy of the railroad reports for 1845, being Senate document No. 20, and on page 118 in the Western Railroad report, I find this entry: '*Amount dividend paid Sept. 1,* $90,000.' This report is also subscribed and sworn to by the directors of the Western Railroad.

So much, Gentlemen, for the statement that they were not able to make a dividend until 1846. Second, they say that in 1846 they divided *five* per cent. I hold in my hand this report for 1846, in which I find this item in their list of expenditures: '*Two dividends of three per cent. each on 34,000 shares,* $204,000.' Does that amount to five per cent. or six per cent., Gentlemen? But, third, they say, since 1846 they have made one dividend of six per cent. and four of eight per cent., and one of six and a half the past year. It would take too much time to recur to their reports in detail, but their reports show that from 1847 to 1851 inclusive, a period of *five years,* they paid eight per cent. or four per cent. semi-annually, and the last year six and a half. Now, Mr. Chairman, and Gentlemen, what are we to think of such statements as these, put forth in the face and eyes of their sworn reports made from year to year? Did they think we would trust to their honor and honesty, and not attempt to verify their statements; or do they mean to give us to understand that this Memorial contains the truth, and that they have perjured themselves year after year for the last nine years in their sworn reports to the Legislature? Let them take whichever horn of the dilemma they choose, I care not.

I have shown that their statement is inaccurate in its first part, inaccurate in its second part, and in its third part; untrue in its inception and untrue in its conclusion. What confidence, Mr. Chairman, and Gentlemen, can you put in other statements which they have made? What assurance have you that they are not as false as those already dissected? Will you believe the scores of assertions found in this Memorial, unsupported by proof and many of them as wide from the truth as the zenith from the nadir? '*Hæc Judeus credat non ego.*'

On the 6th page of this Memorial, the Western Railroad undertake to state our positions, and in stating our third position, they make us say, 'That to secure to Boston its fair proportion of the great Western business, a railroad must be constructed which can afford to carry freight and passengers as cheap or cheaper than they can be carried to New York.' Now, gentlemen, this is a position never assumed or entertained by us for a moment; we do not pretend that freight can be carried as cheap 186 miles as it can be 150, other things being equal. But what we have said, is, that it can be carried by the Troy and Greenfield from Troy to Boston at much less price than it is now carried, in consequence of our shortened distance, reduced grade, and more favorable curvature. And we have in evidence, facts, which enable us to estimate the exact difference of cost of carriage from Troy to New York by the Hudson River Railroad, and from Troy to Boston by the Troy and Greenfield Railroad. Mr. Edwards, the engineer, testified that the difference of grade between the former and latter railroads was in favor of the former, while the difference of curvature was in favor of the latter, so that an engine could carry an ordinary amount of freight as easily and rapidly over the latter as over the former, and that in regard to the facilities of transportation the roads are equal. It is also in evidence

before you, that the actual average cost of transportation per mile per passenger on the thirty railroads of New York, as stated in McAlpine's reports to the Assembly of New York, is 4.62 mills. Now the distance from Troy to Boston by the Troy and Greenfield road, is 36 miles more than by the Hudson River Railroad to New York, the former being 186 miles in length and the latter 150. Multiply 36, therefore, by 4.62 mills, gives a fraction less than 17 cents as the actual difference of cost per passenger for carriage to Boston, over the cost of carriage to New York.

Again, multiplying 7.81 mills (the average cost of transportation per mile per ton on the 30 New York roads) by 36, we have 28.11 cents as the increased cost of carriage of a ton of freight from Troy to Boston, over the carriage of the same to New York ; or in other words, it will cost less than *three cents* more to bring a barrel of flour to Boston than to carry it to New York. And by the same formula, the total actual cost of transporting a barrel of flour from Troy to Boston, by the Troy and Greenfield route, would be a trifle less than $14\frac{1}{2}$ cents, which is less than one half the price now charged by the Western Railroad.

On page 8th the Western Railroad say, 'That eight cents per barrel is deemed a fair price for freight from Albany or Troy to New York. At that port it finds its way by coasters to all parts of New England, at cheaper rates than any railroad that can be built from West to East can afford to take it.'

Now supposing the first part of this statement true, of which there is not a particle of evidence, then add to the eight cents (the cost of carrying to New York) the cost of insurance down the river, say two cents, the cost of transshipment two cents, the average cost of carrying by water from New York to Boston, which Mr. Farwell testified, is 15 cents, and the cost of insurance &c., stated by him to be $6\frac{1}{4}$ cents, and wharfage two cents, and we have $35\frac{1}{4}$ cents as the cost of carriage by water, while the cost by the Troy and Greenfield Railroad, as before shown, will be but $14\frac{1}{2}$ cents, a difference of $20\frac{3}{4}$ cents per barrel in favor of the latter, beside a saving in time of a week or more, and avoiding the danger of injury to the flour by dampness. Mr. Farwell's testimony was, that in his judgment the business of our metropolis would be greatly benefitted by the construction of a road that could make a saving of ten cents per barrel in the cost of transportation, or if we could get within ten cents as cheap in Boston as they could get it in New York, and this is apparent to every intelligent mind. How great will be the benefit by saving 15 to 20 cents per barrel !

But we have other important testimony on this point. Mr. Johnson, the Chief Engineer on the Troy and Boston road, which unites with the Hudson Railroad at Troy, informed you, that at this present time the Hudson River Railroad is competing successfully with the river for the transportation of heavy freight to New York. That they have 447 long freight cars, or miles of cars, as he expressed it, constantly employed carrying freight side by side with the river. Take, in connection with this, the testimony of Mr. Edwards, that freight can be carried over the Troy and Greenfield road as cheap per mile eastward as over the Hudson Railroad, and what becomes of the empty assertion of the Western Railroad, that flour from the West will reach Boston, water borne, against any railroad that can be built ?

On the tenth page of this Memorial, the Western Railroad undertake to state the length of our road, but they are as incompetent to do this correctly as they were to state the truth in regard to their own dividends. They endeavor to make the distance by the Troy and Greenfield road, from Boston to Troy, $193\frac{3}{4}$ miles, whereas it is but 186, while by their road to the same point it is 203 miles; made up as follows, viz., 200 miles from Boston to Greenbush, 6 miles on the Troy and Greenbush road, and 2 miles on the Union road to Union Depot in Troy. Making a difference in the distance from Troy to Boston by the two

routes 22 miles in favor of the Tunnel route. But this is not the only difference in the two routes, our maximum grade eastward is less than forty feet, theirs is *seventy-seven* feet. Our curvature is *seven entire circles less than theirs;* and this difference in distance, grade, and curvature, is, as shown you by Mr. Edwards, from formulas furnished by the engineers of the Western Railroad, equivalent to a practical working difference in our favor of *sixty-five miles.* And yet they say that our road, if built, cannot carry freight cheaper than they carry it. If we cannot why do they oppose us? Why need they trouble themselves about the construction of our road?

Again, the Western Railroad urge the fact, that there has been a gradual diminution of freight, from the West to Boston, on their line since 1847, when the amount reached 88,000 tons to the present year, when it was but 44,000 tons, or one half the amount, in 1847, as a reason why no new route should be opened. And they actually attempt to make you believe that there is less demand for the products of the West in Massachusetts in 1853, than there was in 1847. Not only this, but they strive to make you content with this condition of things, content to sit still and see the trade *driven* away from your own State for the want of easy and cheap means of communication, content to see your own metropolis languish for the want of the very trade diverted from her to build a rival city. This fact of the alarming falling off in the through freight on the Western Railroad, proves conclusively, that the question is not, whether the Troy and Greenfield or the Western Railroad shall bring to our midst the trade and the products of the West, but whether the Troy and Greenfield Railroad shall bring it, or whether it shall not be brought at all. For if it take five years to construct the tunnel, and put the road in operation, and in the meantime the Western Railroad continue to lose their through freight at the same rate as during the last five years, before our first through train shall have made its passage, they will have lost the whole of it, and of course they will have none for our road to take away.

Remember also, gentlemen, while the Western Railroad have been losing their carrying trade at the rate of ten per cent. per year for the last five years, that the Western trade to the Hudson river has been *increasing at the rate of* 12 *per cent. per year.* That the whole amount of this trade last year was 3,500,000 tons, and the annual increase 600,000 tons. Thus it appears the Western Railroad brought last year $7\frac{1}{3}$ *per cent. of the yearly increase of the Western trade through to Boston!!!* What an avenue of communication to build up our Metropolis and our State by the trade of the mighty West. Why, Gentlemen, you might as well attempt to transport the freight of the West to Boston by a single wheel-barrow as by the Western Railroad.

But notwithstanding the loss of through freight on the Western Railroad, their actual receipts have increased, for while their through business has diminished, their local business has advanced so as to more than make good all losses. In 1851 their local passengers were 113,000 more than in 1847, and their local freight 15,680 tons more than in 1847. So that the Western road, in spite of the loss of their through business, will continue to be a good dividend-paying road from its local business alone. There need be then no quarrel between the Western road and the Troy and Greenfield, for each in its appropriate sphere will find all the business it can do, and each will largely contribute to develop the resources of the State. And if by reason of the shorter distance, lesser curvature, and lower grade, the Troy and Greenfield shall be able, as she undoubtedly will, to pour in the products of the West into our Metropolis, and make that great and prosperous, enlightened policy would dictate that the Western Corporation should rejoice at the result; for whatever builds up the capital at their terminus, necessarily increases their business to and from that capital.

Again, though the Western Railroad assure you that they carry freight as cheap

as it can be carried by any road that can be built, they state on page 13 of this Memorial, that the Rutland road, although 49 miles longer than the Western, has taken freight from Troy to Boston at the same price. If there is sound argument in these oft repeated contradictory statements, I am unable to appreciate it. Their Memorial reminds me of the criticism of the old divine upon a licentiate's sermon, 'It consists,' said he, 'of false positions, broad assertions, and flat contradictions.'

On page 17 of this Memorial, commences a long jeremiad extracted from the report of the Committee of 1848, who reported adversely to the grant of the charter of the petitioners. It is sufficient to say that such report was overruled at the time by the action of both branches of the Legislature, as before stated, and ought not therefore to have any influence on this Committee. But I would recommend to the Committee to preserve the extract to read on some drear November evening, in connection with Zimmerman upon Solitude, and De Quincey's Opium-eater's cogitations upon death and blue ruin.

We come then, gentlemen, to the recapitulation of the reasons urged by the Western Railroad against granting the prayer of the petitioners. They are, 1. That ours will be a competing route with theirs. 2. That it cannot be constructed so as to carry freight from Hudson River to Boston as cheap as it can be carried by water via New York. 3. That Western produce 'is wanted in New York, (*or in Boston via that place*,) and therefore it goes to New York.' Let us dwell a moment on this last proposition. Boston is the metropolis of New England, which contains about 3,000,000 of inhabitants. It is the natural market besides of Nova Scotia, New Brunswick, and a portion of the Canadas. The manufactories of cotton and woollen are here. Yet Massachusetts does not want the products of the West except, in the language of the Western Railroad, '*via New York.*' The inquiry of the purchaser when he enters the market is not, if we may believe the Western Railroad, is your flour good, is it reasonable in price, but the one all absorbing question is, has it come '*via New York?*' if it has, it is in demand, if not, it is not wanted!! The profundity of this reasoning entitles it to take the place of Butler's Analogy in all future collegiate instruction.

The 4th reason against granting the aid sought is, that the new line cannot be constructed so as to transport freight cheaper than the existing roads in New England.

If their 2d and 4th propositions are true, they destroy the first, and if the first is true, it contradicts the 2d and 4th.

Their 5th reason is — but their 5th is *non est inventus*, it has dropped out, it is nowhere to be found — perhaps they designed we should imagine it; and we can much easier do this than we can see the harmony and force of the propositions already urged.

The 6th — that our road is not required for transportation between the West and Boston, there being four routes already, viz., via Western Railroad, via Troy, Rutland and Cheshire, via Ogdensburg and Vermont Central, and via New York and Long Island Sound, and they declare that the last three are competing with them for the Western trade! There are two other avenues of communication, between the West and Boston, already in existence, not enumerated in the above list, which I will mention, that the Western Railroad may incorporate them in the next edition of their Memorial, viz., via Albany, Buffalo, Cincinnati, New Orleans and the Gulf Stream to Boston, and Buffalo via Lake Ontario, St. Lawrence, and Cape Sable to Boston. There is also a projected route which it would be well to include, viz., Albany via Chicago, St. Lewis, Salt Lake, San Francisco and Cape Horn to Boston. This last route is expected to demonstrate for all coming time the ruinous policy of competition in trade.

In reply to the statement, that the present means of communication are sufficient, I need only remind you of the fact that flour in immense quantities

has lain piled up in Ogdensburg since last November, and that the owners have lost the market because they could not get it forwarded.

I have thus endeavored, in the capacity of an under officer, to pass over the field of action, and note the havoc made by the discharge of the Western Railroad battery. The Dutchman who had loaded his gun so heavily that in its discharge the recoil kicked him over, concluded that the gun shot at both ends. Whether the Western Railroad battery has any characteristics in common with the Dutchman's gun, I leave for you to determine.

But, Gentlemen, before I leave this Memorial, I wish to notice the statement of the vote of the House of Representatives in 1851, against a bill in favor of the petitioners, similar to the one now asked for. The Memorial states this vote near its commencement, and closes with its repetition, as though that alone were conclusive evidence against the present grant. The remonstrants neglect to state, accidentally of course, that that same bill was reported unanimously by the Committee, and passed the Senate 23 to 11. Now, Gentlemen, I profess to understand something of the means by which that vote was brought about; for although I cannot say with Æneas, *quorum pars magna fui*, yet I was a member of that House and was one of those who voted against that bill. Those gentlemen on the Committee who were then members of the House will bear witness to the correctness of my statements. That was a session of unusual political excitement and party strife. For five months, day after day, and night after night, the contest for a United States Senator raged. The legitimate business of the session was crowded into a few weeks at its close. The orders of the day covered some ten to twelve pages. In such a condition that bill came into the House — the project was new and not at all understood — the Western Railroad, alarmed at the passage of the bill through the Senate, thronged the lobbies with agents to operate on the members. Every morning we found in our seats a fresh batch of pamphlets decrying the project of tunnelling the Hoosac. The newspapers far and near were subsidized — engineers were hired to write letters stating that it would take sixty years to tunnel the mountain. Remonstrances, procured by bank bills despatched in letters to all parts of the State, poured in upon us. Ridicule, the last weapon of a weak cause, stimulated by gold, lent its aid. In short, every expedient within the reach of a strong corporation was resorted to — and, as the result shows, successfully — to defeat the bill. Under such circumstances, having no correct knowledge of the merits of the case, and having no time amidst the pressure of other business to investigate the matter, I voted against that bill, and my vote and the votes of other men given under the circumstances stated, are held up as reasons why you, Gentlemen, who have investigated and understand the merits of the case, should vote against the prayer of the petitioners. But, Gentlemen, while I voted against the petitioners in 1851, I said to them, 'Go on and perfect your machine, show the Legislature by actual experiment that you can cut into the rock as you suppose, and you will secure the grant you seek.' They have shown by actual experiment in your presence, Gentlemen, that they can cut into the rock, as they claimed they could in 1851. I shall now do what lies in my power to make good the assurance then given them. And I am confident that you, Gentlemen, will not feel embarrassed in your action by the vote in 1851.

Mr. Chairman and Gentlemen, I have done with the memorial of the Western Railroad. I am glad to free myself from the mist and the sophistries with which it would shroud this case. I would for a moment regard the prayer of the petitioners upon its merits, uninfluenced by the insidious thrusts of a great corporation.

On the northern line of this State for a distance of forty miles, along the banks of the Deerfield and Hoosac rivers, lies a section of country almost unequalled for fertility, rich in minerals, and possessing great manufacturing facili-

312 SA

ties, entirely shut out from market, her timber rotting upon the soil where it grows, her water power unemployed, her marble lying useless in its quarries, her rich ores unwrought, all for the want of those modern easy means of transportation which you have so liberally furnished the money to construct in other sections of the State. On the eastern border of the State you have granted to the Eastern Railroad, to the Nashua and Concord, and the Haverhill Railroads some $600,000. To the Norwich and Worcester, leading from the heart of the State southward, you have granted $400,000 To the Western Railroad, stretching along the entire southern border of the State, you have granted $5,000,000. To the northern section of the State you have as yet granted nothing, though she has cheerfully contributed the means of developing the resources of other sections of the State. Shall this inequality continue? Will the State shut out from her fostering care a large portion of her domain? Justice forbids it.

Again. The State has stretched out her net-work of railroads to all parts of her territory, except to the portion affected by the grant prayed for; and she has experienced a temporary prosperity in consequence of this; but she is still hemmed in for all practicable purposes of trade between the Green Mountains and the Atlantic. Will she be content to remain thus circumscribed and shut out from the boundless and ever-increasing trade of the West?

Will she stand idly by and see New York fattening upon the traffic which legitimately belongs to her own metropolis, and for the want of which her own metropolis must inevitably languish? Shall a small mountain barrier of four and a half miles in extent, paralyze her energies, while her sister States are perforating the Alleghanies in every direction? The prosperity and the honor of the State forbid it. Is it said that the length of the proposed tunnel exceeds that of any other railroad tunnel ever constructed? But for the poverty of these petitioners, and the urgent need of having a highway of communication opened immediately to the West, I should rejoice at this fact. As Massachusetts has been the pioneer in railroad building, I would have her foremost in the construction of a tunnel that shall excite the admiration of the world, and foster the laudable pride of her sons in overcoming obstacles to her growth. Massachusetts has ever been equal to any emergency, will she now hesitate to do what other States have done to promote their prosperity? A false conservatism may possibly retard the accomplishment of this project, but be assured, Gentlemen, the spirit of the age is with us and will push this project to completion.

I conclude, Mr. Chairman and Gentlemen, with the assurance which I profoundly cherish, that neither the interests of the petitioners, the prosperity of the State, nor the honor of the State, all of which are involved in the decision of this cause, will suffer at your hands."

Friday, April 1.

The Committee met in the Senate Chamber pursuant to agreement, at 3½ o'clock, P. M. Mr. Davenport in the Chair.

The Western Railroad Corporation appeared by DAVID THAXTER, Esq., as Counsel, and moved an adjournment to the Tuesday following, but the Committee unanimously voted to proceed, and E. H. DERBY, Esq., then commenced the closing argument for petitioners, and spoke substantially as follows:

"Mr. Chairman and Gentlemen of the Committee — I have the honor to appear again before you in behalf of the Troy and Greenfield Railroad Company, for aid to assist them in tunnelling the Hoosac Mountain, and hope not to weary you by the argument which I deem it my duty to submit.

It was well remarked by Lord Bacon, that three things constitute the greatness of a State — fertile fields, busy workshops, and easy means of communication. We have in Massachusetts the workshops, the West beyond our mountains has the fertile fields, and what we need to constitute greatness, is an easy communication from those fields to the workshops.

We have upon the line of our railroad two beautiful valleys; the Deerfield valley, rich in a fertile soil, immense water power, an active, intelligent population, musical with the hum of industry, studded with factories and workshops, and the Hoosac valley, celebrated for its productive farms and its busy inhabitants. These valleys are separated by a mountain barrier. Did I say mountain? it is, rather, an elevated plain. You, Gentlemen of the Committee, have passed over it, and have seen farm-houses and cultivated fields all along the route, even to the very summit. But it interposes a barrier between Massachusetts and the West. If we can perforate it, we unite by easy communication, the mechanic and manufacturing arts, the educated mind of the Old Bay State, with the agriculture of the fertile West.

I will not for a moment suppose that this barrier is an insurmountable one to Massachusetts enterprise, or that our energy will halt before it, except to adapt its means to the end. There it stands, inviting our skill, sagacity and labor, and the reward of success is admission to a country of unbounded fertility. It would seem, Mr. Chairman, that Providence had interposed this barrier to try the mettle of Massachusetts.

What is there before us in this enterprise that we have not before accomplished? We have exalted the valleys and brought low the mountains. We but change the form of our proceedings, and now go through the mountains, as an obvious improvement over our former practice. You, Gentlemen of the Committee, have examined the valleys of the Deerfield and the Hoosac. You have passed over the whole line of our route — have seen the mountain and seen the machine. You are citizens of New England, and are included in the generic term Yankee. A reverend clergyman the other day defined a Yankee as 'a well developed point of interrogation.' It was a hapy definition. I noticed during our late journey that the eyes of the Committee were open; that they asked questions and examined every point of interest. You saw the factories upon the route — know something of the vast forests of hemlock bordering it — discovered the quarries of serpentine, iron, soapstone, lime and flagging — noticed the mill privileges, and the thriving and industrious villages that line it. I will not weary you by recapitulating this part of the case.

In behalf of these petitioners we invoke your aid to tunnel this mountain. We have shown you the way; have proved its feasibility, and exhibited the estimates of the most eminent engineers now living. We have taken our chaplain* along with us, and he has given you quotations from Holy Writ, as an encouragement in our application — 'Ask and ye *shall* receive, knock and it shall be opened unto you.' It will be my province, this afternoon, to ask this aid at your hands and from this Legislature, and to give some reasons, for the faith which is in me — for I am one of those who believe that Massachusetts ought to put her hand to a work like this, which will tend so much to advance the wealth and honor of the State.

I beg to refer you, in the first place, to a book written by an eminent man, who became eminent before I was born, and who 'still lives' in the enjoyment of his intellectual faculties, the most eminent philosopher of the age. I can refer, of course, to no other than Humboldt. In that volume I find a description of a tunnel constructed in Mexico, in the year 1607, two hundred and fifty years ago. Mexico, at that early day, constructed a tunnel more than four miles long, nearly as long as our Hoosac Tunnel, and are we to be told that in New England, in 1853, with all her science, ingenuity and intelligent industry, it is impossible to build a tunnel 24,000 feet in length?

The famous subterranean gallery of Nochistongo was commenced on the

* Rev. Thomas Whittemore, President of the Vermont and Massachusetts Railroad, who accompanied the Committee to and over the mountain.

28th of November, 1607. The viceroy, in presence of the *audiencia*, applied the first pickaxe. After eleven months of continued labor, the gallery (*el socabon*) was completed. Its length was more than 6600 metres, (or 21,653 feet,) and its height $13\frac{3}{4}$ feet. In the month of December, 1608, the Viceroy and Archbishop of Mexico were invited by Martinez, to see the water flow from the Lake of Zumpango, through the gallery.

Thus we see, that in eleven months this great work was accomplished by a handful of Spaniards and a party of Indians. In 1608, the Marquis de Salinas entered the tunnel 2000 metres on horseback. In twelve months it was formally opened. I trust, Mr. Chairman, that you, unlike the Marquis de Salinas, who rode in on horseback, will have the pleasure, before many years, of riding through our tunnel in comfortable and well-cushioned cars.

But there are public works in other parts of the world than Mexico, to which I will call your attention. In the strife for improvement, in our country, New York is extending her iron arms, and has invested some $40,000,000. Pennsylvania has given her $40,000,000 for internal improvements, and to help her communications, and her valuation, to-day, is less than that of Massachusetts. Maryland has invested $15,000,000, and she is reaching the Ohio river through routes on which there are thirty-two tunnels. Thus much for the United States and for the present.

England, whose enterprise and capital has lined the exterior of Great Britain with artificial harbors, has expended in one single enterprise, the tubular bridge, to connect an island with the main, four millions of dollars. But, when we talk of expenditures, all others sink into utter insignificance compared to what the little State of Holland has done. We have it from Baldwin's report, that Holland, a State fenced in from the sea with but fourteen thousand square miles of surface and two and a half millions of people, has expended the sum of *one thousand three hundred and thirty-two millions* in public works, principally appropriated to dykes and canals to keep the sea within its proper bounds. We do not propose to expend your loan of two millions on dykes to reclaim a few acres of marsh or of flats, but we propose with it to grasp the mighty West, and open a highway to three hundred thousand square miles of the richest territory in the world.

What has Massachusetts done towards reaching this great territory? She has opened the Western Railroad, whose President I am happy to see present on this occasion. That Corporation, in its infancy, invoked the aid of the State, and it was granted in no limited measure. At that time, the valuation of Massachusetts was $200,000,000; according to the census of 1850, it was $600,000,000; and to-day we are worth, Mr. Chairman, nothing less than $700,000,000. If we were to ask aid in the same ratio that the Western road has received it, we should be entitled to seventeen millions and a half. But we ask for only one-eighth of that sum, and shall we ask in vain? If the Western road is the senior partner, we are content to ask to become the junior and humble partner of the State in the great progressive movement of the age.

The idea of a tunnel through the Hoosac Mountain is not a novelty or a humbug. It has, long years ago — twenty-six years since — been presented to the Legislature of Massachusetts, under the sanction of the most eminent Engineer New England has produced. I speak of the late Loammi Baldwin. Mr. Baldwin possessed an extraordinary genius; he travelled extensively in Europe to improve himself in his profession; he made the acquaintance of all the eminent engineers of the day, and visited there all the great public works.

On his return, his abilities and experience were required by the government. Who, Mr. Chairman, constructed the dry dock at Charlestown and Norfolk? Loammi Baldwin. He had 'carte blanche' from the government. Who made the first canal in the country? Loammi Baldwin. He was employed to survey

a route for a proposed canal from the seaboard to New York. He examined three lines, and gave the preference to a line through the Hoosac, and stated that it could be tunnelled at a cost of $3 per cubic yard. His authority is sufficient; but he was not content with it himself. He consulted Gen. Bernard, then at the head of the Ordnance Department of the United States, who entirely concurred with Col. Baldwin in his estimate. Then Col. Baldwin determined that the tunnel was not only feasible and practicable, but that it was the best way to reach the West. Why did not his views prevail? Unfortunately the wealth and talent of Worcester and Springfield were arrayed against the tunnel. A distinguished gentleman, lately deceased, of Leicester, the head and leader of a great political party, employed his power and influence to carry the railroad through Leicester. He used his pen with great effect, and his satire was sufficient to divert, for a time, the improvements of the State from their natural channel. That is the reason why the tunnel was not then constructed: the building of the Western Railroad was adopted as an alternative, and that has made Worcester and Springfield what they are, great and growing inland cities, and has built up Palmer, Leicester, and all the other towns along the line of its route.

Is the tunnel feasible? I would here advert to the fact that the feasibility of the tunnel was thoroughly discussed when the charter of the Troy and Greenfield Railroad was granted. The Committee in reporting that bill, and the Legislature in enacting it, decided upon the feasibility of the Hoosac Tunnel.

Now Mr. Chairman, let me call your attention to a few facts — not theories — which have been proved before you in evidence at this hearing. We make a great saving in distance to the West, and substitute for a costly ferry, a bridge across the Hudson.

We provide also at this Port, in place of a Depot inaccessible to ships, a range of piers and warehouses, where ships of the line may float at their moorings. The Albany ferry is equivalent in time to twenty miles of railroad, and in expense of transferring freight from railroad to railroad, is equal to *many* miles of freight transportation.

Then as to grades. The remonstrance of the Western Railroad does not give an exhibit of the grades fairly. According to the evidence of Mr. Edwards, our Engineer, the total rise and fall on the Troy and Greenfield Railroad, between the Hudson River and the Connecticut, is 1,598 feet. The maximum grade is $31\frac{68}{100}$ feet in Massachusetts, $26\frac{4}{10}$ feet in Vermont, and $39\frac{6}{10}$ feet in New York. Compare this for a moment with the grade on the Western Railroad between the same points. There you have for total rise and fall, 3,420 feet, and a maximum grade of 77 feet to a mile. When you consider this difference, you will see the vast saving that is made in the grades of the Troy and Greenfield Railroad over the Western road.

Thus you have a saving by the tunnel route of 22 miles from Boston to the Hudson at Troy, and a saving of distance between Troy and every important town in Northern Massachusetts, ranging from *twenty* to *seventy* miles, shortening by that length our communication with the entire West. The average saving of distance to the whole of Northern Massachusetts, is between 30 and 40 miles.

Now as to summit elevation. On the Western road the grade, at the summit, is 640 feet higher than at the tunnel. The Western road has five summits, we have but three, between the Hudson and Connecticut, and our equated length, as compared to theirs, is as 120 to 180. But we have another advantage. We pass the Connecticut River above a series of falls. Instead of descending 135 feet, as is done by crossing the river at Springfield, we save so much of the elevation, gained by crossing the Connecticut nearer to its source.

Then in the matter of curvatures we make another vast saving. The shortest radius of curvature on our road is but 1228 feet, and there is but one curve of

this length. On the Western Railroad there are three curves of less than 900 feet radius. We have shown by the testimony of Mr. Edwards, and by the evidence of the Reports of the Western Railroad, that the difference in curvature between the western division of that Railroad and the Troy and Greenfield road, is equal to more than seven entire circles in our favor. Mr. Chairman, I cannot impress upon the Committee the full importance of this saving. Look at it for a moment. You are coming at great speed with a train of 100 tons, and the strain on wheels and axles is fearfully great, sometimes breaking the axles, and resulting in the destruction of human life, as was the case in a late melancholy instance which caused a bereavement in which the entire nation joined its sympathy with the bereaved. Where, Sir, are these fractures most liable to occur? On roads where high speed is attained, having tremendous grades and frequent curvatures. By adopting this line to the West, you avoid these grades and curvatures, and if we can economize in human life, rendering it more secure, less liable to accidents, are we not doing a benefit to humanity? And if it should so happen that the dividends of another road were reduced one per cent., is that a consideration to be urged against this great and obvious public blessing?

But I will leave this branch of the subject and pass to one of the great features in the case now before us. *What is the tunnel to cost?* Will it cost two millions, or three, four, five and six, as it has been stated in some respectable papers, over respectable signatures? The evidence answers the question, and to that evidence I now call your attention. We have placed before you the testimony of our Engineer. He has cast the cubic contents of the tunnel, and we arrive at the conclusion, the certain conclusion, that there are imbedded in the mathematical lines which he has drawn, 361,500 cubic yards of mica slate. We have shown that you can dispose of this material outside of the tunnel for 80 cts. a cubic yard. Give us your check for $300,000 and the thing is done. Now *in* the tunnel how much more is the work to cost? We have estimated it at *six and a half* times as much, which, we think, we have demonstrated, is a sufficient estimate.

Now, as to the rock which we have to deal with. We have given you the evidence of Professor Hitchcock of Amherst College, Professor Emmons of New York, the State Geologists of Massachusetts, New York and Virginia, and other eminent professors, who have examined the formation, that the whole mountain is composed of mica slate and talcose slate, which shows itself on the Deerfield, on its summit, and at the western base. The mountain does not rise perpendicularly. It is a long plain of table-land, traversed by vertical strata of mica slate, so soft that it cannot be used even for flagging-stones; it will not form a pavement for boots and shoes. That is the character of the rock, and all geologists who have turned their attention to it, say it is the same throughout. But interested parties imagine there will be trap-rock found there and other hard material. Suppose it possible, that, by some great upheaving of nature, such is the case. Suppose we do encounter a harder stone than the mica slate. It does not add one cent to the expense of getting it out of the tunnel; it only costs a little more in the drilling. If we assume the cost of tunnelling mica slate at $2.60 per yard, the average price paid for tunnelling on the Baltimore and Ohio Railroad, the tunnel will cost $940,000. But suppose that we add a dollar per cubic yard for this contingency, we excavate the whole tunnel for $1,300,000. We have assumed that the roof will sustain itself without masonry; but suppose that it needs lining, we have but to add $500,000 for that expense, and you have the tunnel complete for $1,800,000.

Mr. Edwards, in his estimates which are before you, has given the entire length of the tunnel as 24,100 lineal feet; the total amount of excavation is 361,500 cubic yards.

Cost of the tunnel per lineal foot, $69 52, viz.:

Superficial area	A.	36 feet,	50 cents per foot,	$13.50 a yard			$18 00
	B. B.	100 "	30 "	" "	3.10	"	30 00
	C.	269 "	8 "	" "	2.16	"	21 52
		405 cubic feet, equal to 15 cubic yards,					$69 52

Cost per cubic yard,	$4 63½
Whole amount for excavating tunnel,	$1,675,432 00
Masonry, 6025 perch, at $5,	30,125 00
Air-pipes and fixtures,	54,000 00
Superstructure, including iron, &c.,	64,000 00
Engineering and contingencies,	125,000 00
	$1,948,557 00

The above calculation is based upon an excavation of the entire tunnel without any shafting, to occupy 1556 days.

If a central shaft should be sunk, thus making four working faces, and dividing it into sections of two and a quarter miles each, it would reduce the time of working to 1054 days.

It is to be understood that this computation is made on the old mode of working, with the increased facilities that the present steam-drills now in use will give.

But we have not contented ourselves with the opinions of Loammi Baldwin and Gen. Bernard, and the estimates of Mr. Edwards. We have put Mr. James Hayward on the stand. You, all of you, saw and heard that gentleman, who had devoted a large portion of a long life to the profession of engineering. I know him root and branch, and had the privilege of studying mathematics under him at Harvard University. Testimony from that source is not to be lightly regarded. Well, Mr. Hayward, who has no pecuniary interest in this project, but as a resident of Plainfield and a citizen of the Old Bay State, has a desire to see it triumphantly executed, has examined the mountain, and Mr. Edwards is fully confirmed by Mr. Hayward, in the estimates he has submitted.

We have done more than that. Mr. Hayward, during a visit to Europe, made the acquaintance of the most celebrated engineers of the day, and he has visited all the important tunnels both in this country and in Europe. He has seen those tunnels and communicated with the engineers who constructed them, and has obtained from them, estimates, profiles, and details of cost. He describes various tunnels, and first he gives you the cost of the tunnel on the Reading Railroad in Pennsylvania, — the Pulpit Rock Tunnel, — which cost $66.20 per lineal foot. At this rate the Hoosac Tunnel would cost $1,595,000. Then he gave you a detailed account of the Nerthe Tunnel, near Marseilles. Here is a tunnel three miles long, which passes far beneath the surface, having 24 shafts, of an aggregate length of 7,589 feet, the deepest of which is 610 feet, all lined with masonry. Two of our shafts will be a little longer than that, but the three will average the same. He testified that labor and engineering cost quite as much in France as it does here; that the broken strata admitted large quantities of water. The Nerthe tunnel cost the contractors but $1,114,763. The area of this tunnel was larger than ours, and the contents greater in cubic yards; allowing for the difference, the Hoosac must cost but $1,329,776.

But not content with going to Mexico and France for examples, we bring you to England. We come first to the Woodhead Tunnel. Here is a tunnel which is carried, not through mica slate, but through mill-stone grit, a granitic formation, not quite so hard as our granite, but harder than the Hoosac rock. It is a little over three miles long, and the hill is over 600 feet in height. It has five shafts, from 400 to 600 feet deep, sunk through this granitic rock. This tunnel was five years in construction, and its whole cost was $1,026,705. Ours, at the same rate, would cost $1,556,000, leaving from the estimate of our engineer upwards of $400,000 for contingencies.

Here we have taken the longest railroad tunnel in England, and the longest in France, and from the Engineers' statements of their actual cost, we find that ours will cost something like $1,500,000.

We come next to the estimate of the Engineers of the Western Railroad.

When the Western Railroad comes here to oppose us, it is with extreme pleasure that we are enabled to put in their own evidence in our behalf. Their engineers having superior talents, and liberal pay for the exercise of them, have given their evidence of the cost of the tunnel, and they say in their printed report to the Western Railroad, that the cost of a tunnel in gneiss or mica slate, through the Berkshire Hills, will not exceed $65 per lineal foot. This is the estimate of Capt. Swift, Gen. McNeill, and Col. Whistler; but Capt. Child, who is an economical man, thought that the work could be done for $60. Here was a guide for them to go by, and they put their theory in practice at Canaan. Their Canaan Tunnel is for a double track. What was the result of their experience? It came out that the tunnel cost $63 and a fraction per lineal foot, just between the estimates of Mr. Child and his superiors. The Western road, by their own engineers, have shown us the cost of our tunnel, and if we cannot build it ourselves, we will call upon them to come and help us. The actual cost of the Hoosac Tunnel, by their estimates, will be $1,568,000, and if Capt. Child is correct, it will cost but $1,500,000.

After having examined the cost of French and English tunnels, and the cost of the Western Railroad Tunnel, we conclude that our estimate is made on a most liberal scale, ample to cover all possible contingencies. But not content with consulting eminent Western Railroad gentlemen, with salaries of $5,000 per year, we have gone to England, and taken the opinions of gentlemen whose salaries are £5,000 sterling per year, such as Stevenson and Brunel; they refer us to Marchant, an eminent contractor and engineer, and he estimates the cost of our tunnel at $700,000. His is the lowest estimate, and really, gentlemen, I am almost afraid to tell you how low he has estimated.

We have next called your attention to the enterprise of the Sardinian Government, conducted by the eminent Belgian engineer, Chevalier Maus — pronounced Mouse — and he is going to creep like a mouse through the interior of the mighty Alps. His plan is to pass through Mount Cenis five thousand feet below the summit, a distance of nearly eight miles. His plan is approved by Stevenson, and at his estimate for that gigantic work, our tunnel would cost only one million of dollars. Thus you see, Mr. Chairman, we mean to count, and have counted, the cost of our house before we build it, and have a margin left, to put into a sinking fund and to defray interest.

In Massachusetts we happen to have, at present, no tunnel, and we have been alarmed when the subject has been proposed, for the simple reason, only, that they are strangers. In Ohio, Pennsylvania, and Virginia, they are familiar with them. Maryland, in reaching to the Ohio river, has encountered thirty-two of these strangers; instead of making there short curvatures and heavy grades, they go through the mountains at a cost only of $2.60 per cubic yard.

But I will say nothing more about the cost of the tunnel, but consider the time required for construction. Gentlemen who write for the newspapers, say it will take forty years to accomplish the work, and they make themselves exceedingly merry over their own imaginings. Let us look at this for a moment. In the first place, our engineer says it can be done in five years, without a shaft. Then as to the shafts, three are proposed. What will be the effect of these? Our tunnel of four miles and an half in length is cut into four tunnels of about one mile each, and our great tunnel, which is such a giant in these newspapers, comes down to a smaller space than many tunnels already accomplished.

With the three shafts, the average length of each of the four tunnels, into which it is divided, will be $1\frac{1}{8}$ mile, and we open eight faces for the miners.

We propose to employ three relays of men in the twenty-four hours, to work eight hours each. Now what can they accomplish? We have heard from Mr. Hayward, evidence as to the experience in England. Shafts are there sunk at the rate of three feet a day, and in the Blechingly Tunnel at the rate of $3\frac{6}{10}$ feet per day. We propose to work faster than that, and our engineers say we can sink four or five feet a day. But in addition to this testimony, we have evidence of the length of time required in sinking shafts at Pottsville. A shaft there was sunk at the rate of three feet per day, and Mr. Knight, the proprietor of the machine drill, thinks that with that machine he can go six feet per day. Under the common mode of drilling, they sink their shafts three feet per day, through the hardest rock. We bring you a drill machine which has already been adopted by several railroad companies for their excavations, which goes down six feet per day. Taking this machine on to our mountain, we complete the shafts in six months. But let us assume it will take one year to complete them. We have then eight faces of the tunnel to work upon.

What will be thus accomplished? We have been at work all this time at either end of the tunnel. The Engineer's testimony is, that the drift can be carried in at the rate of 30 or 40 feet per week, and that the whole face of the tunnel can be excavated at the rate of 900 lineal feet per year. If you take this statement as the basis for your calculation, you have, in the course of four years, achieved your tunnel, with three shafts. I put this to you on the testimony of engineers and of scientific men, who have given their evidence in this case.

The Nerthe, the Box, and the Woodhead Tunnel, each of great length, and containing more cubic yards of stone than ours, and more subject to water, were finished within five years.

From the evidence concerning the Alleghany Mountain Tunnel on the Pennsylvania Railroad, we learn that the miners at this tunnel perforated the ridge in fifteen months. The length of the tunnel is 3,570 feet. The heading at the west end was commenced on Oct. 14, 1851; at the western shaft, Nov. 15, 1851; at the middle shaft, Nov. 1, 1851; and at the east end, Nov. 14, 1851. The headings at the shafts, on account of the quantity of water at first encountered, were worked only a part of the time. The engine at the middle shaft was insufficient, and was replaced by a powerful pumping engine, in the Spring of 1852; taking these delays into account, the working would not be equal to more than at three different points. The time, from the commencement of the work at the west end until daylight was through, is $15\frac{1}{2}$ months.

Whether the machine works or not, we give you the tunnel in five years. This is according to the most careful and reliable evidence we can produce. We have given you, upon the authority of the same evidence, the probable cost of the tunnel, and have asked you for enough to cover the cost. We have been told not to come but once to this Legislature. The sum we ask for is enough to cover all the probable contingencies that may arise.

We come now, Mr. Chairman, to the machine. You have seen it. It has been tested in your presence, it has told its own story; it has made its speech to you. It has knocked at the door of the mountain, and is ready to go in; it remains only for you to open the door. In the principles of its construction, it appears to be admirably adapted for the purpose. It is imperfect yet, and several obvious improvements are to be introduced before it is put actually to the mountain. There was one feature about the work performed by it, that struck me with great force. It cuts through the mountain with regularity and precision, leaving the walls of the tunnel finished like the front of an elegant edifice. But, gentlemen, I leave the machine to make its own impression upon your minds, it being more eloquent than any speech of mine.

There are other considerations to which I will now call your attention. I remember a letter written not long since by an eminent and respected citizen,

who had signed a petition in aid of this memorial. He wrote a letter requesting a withdrawal of his name from the petition. And wherefore, gentlemen? What reason did he give? Why this,—That the tunnel would be so dark that it would be dangerous to pass through it, and that for want of proper ventilation human life would be imperilled. I should not have thought of making this point, but the letter has been published, and it has produced its effect.

Is the tunnel, let me ask, darker than the darkness of night? If so, we have the light of the powerful reflectors which are placed at the head of the locomotive, and which cast their rays three miles ahead. Is it dark in the cars? I recollect to have read of instances where, in passing through tunnels, the court-plaster upon a lady's cheek has been transferred to the lips of a gentleman; but, gentlemen, this is the worst that can happen, even though that result take place in our Hoosac Tunnel.

Then, Sir, as to ventilation. We have, unfortunately, accidents of daily occurrence by flood and field, but have you ever heard of any instance of the smothering of passengers in a tunnel? Here is a tunnel with an arch overhead of 25 feet in height. You have the evidence before you of Gen. Pasley, the Inspector-General of Public Works in Great Britain. He, with his party, went to inspect the Thames and Medway Tunnel. It is $2\frac{1}{4}$ miles long, and all the shafts but one had been closed. The party were in the tunnel through an entire day, and were engaged a portion of the time in firing billets of wood from mortars at the roof, to ascertain the security of it. Trains were passing every hour in the day, and what was the effect? The smoke and steam of the engine and the mortar rose in a light wreath to the crown of the arch, and were condensed against the arch of the tunnel. The tunnel ventilated itself.

How do they ventilate the coal-fields of England? That country is cultivated on two levels; the fields above, and the coal-fields below the surface. In those long tunnels they make two shafts, and place a furnace under one, which finds a chimney in the shaft and makes a draft so strong as often to extinguish the candles of the miners. But they tell us the miners are going to perish before they reach the openings for ventilation. We have shown you in evidence, how, by a very simple contrivance, ventilation is supplied to them. Thus, Mr. Chairman, we dispel this cloud which is raised by interested parties against us. We shall have no letters on that subject during this session.

I have thus disposed of the physical difficulties, and come to the important question, Can we give you security for your money? We propose to build with the tunnel 40 miles of railroad. The question is, Will the road itself be of any value to the State before the tunnel is completed? We have put in evidence tables, showing the population and business of the route. By the evidence of Mr. Porter, late of the Governor's Council, we have shown that the population on the line of the Western Railroad was 936 per mile between Worcester and Springfield, and 559 per mile between Stockbridge and West Springfield. We show you, by the same evidence, that the population on our line is 1158 per mile, and the business more in proportion to the people, for the country is superior in soil, minerals and water-power, to that on the line of the Western Railroad.

Let us call your attention to the lively and interesting town of Adams, with its population of 7,000, and its thirty factories; to Shelburne Falls, which is increasing with an unexampled rapidity. We have shown you the resources of the valleys through which the road passes—the lumber, stone, iron and various articles for freight which that region of country affords. Our line is better than the best part of the line between Worcester and Springfield. I venture to assure you, gentlemen, that the road is a sufficient security for the State. We intend to buil the road *pari passu* with the tunnel.

We propose to give you ten miles of railroad and three thousand feet of tunnel, before we ask you to pay a cent of the two millions you will *loan* us. We pro-

pose to ask you to lend us $20,000 a miles on our railroad, and offer, as our security, our road and tunnel. Seven miles are nearly finished, and we shall have ten miles of railroad in actual operation, and three thousand feet of tunnel completed, we shall be $500,000 out of pocket in actual expenditures before we ask you for the first instalment of $200,000. We are not unreasonable when we ask that this proposition be accepted. Other corporations have received the same aid in the same ratio. The Norwich and Worcester road received the State assistance in the sum of $400,000 on twenty miles of railroad. This was to help and accommodate Connecticut and the southern tier of towns in the State. We simply ask you, Mr. Chairman, to do for the northern part of the State what you have done for the southern and for another State.

When we have completed twenty miles of railroad and six thousand feet of tunnelling, we ask you for $200,000 more. When thirty miles of railroad and nine thousand feet of tunnel are completed, we ask for $400,000 more. When twelve thousand feet or one-half of the tunnel are completed, we ask for $400,000 more. When, in addition to the road, we are three-quarters through the mountains, we ask for $400,000 more; and when we are entirely through, and can see the daylight, and our line in operation, we ask you for the residue of the $2,000,000.

We propose to take ten per cent. of the $2,000,000, and place it in a sinking fund for the gradual extinction of the debt. If our plan is feasible, we ask you to adopt it. Recollect that we advance three thousand feet into the tunnel before we ask you for a dollar. If we find that we cannot proceed the 3000 feet, rest assured that we shall not come to you for the first instalment. If we can go 3000 feet, we have demonstrated that we can do 30,000 feet, and our work must proceed. Our plan is not like the plan of those railroad men in Vermont. We do not wish to charge this great public enterprise with ten per cent. interest, by issuing bonds at seven or even eight per cent. and selling them at a discount. It is a great work which we have in hand, and we will not burthen it with an interest of more than five per cent., which we can do having your guarantee, for we can take your bonds on to the London Exchange, and there dispose of them at a premium. We don't mean to begin and be obliged to stop our work, neither do we want to leave our contractors in difficulty. Having secured your guarantee, we secure them. We collect our funds, our stock is taken up, and we go on with the enterprise.

I trust, Mr. Chairman, that we have made out a case. But we have objections to meet. The Western Railroad comes here with a remonstrance. I have looked over that remonstrance, and find it is the strongest argument in our favor that can be found in this whole case. We have placed in our hands by the officers of that Corporation, the very argument we wanted to make our evidence complete. We put our memorial upon the ground that the Western Road cannot accommodate the trade of the West. They tell us that the cost of carrying passengers is $3 per head, and of freight $3 per ton, or $1\frac{1}{2}$ cents per mile between Boston and Albany. They are losing money by the through traffic: they can't carry a barrel of flour from Albany to Boston for less than 30 cents a barrel, and live. That statement is just what we wanted. We have shown to you what a road of easy curves and light grades can do, and we have shown by tables compiled from the official reports of the State of New York, that it costs but one-half cent a ton, and per passenger a mile to transport freight on such roads in that State. We have cited the instance of the Reading road, in Pennsylvania, where freight is transported one hundred miles at the rate of 54 cents per ton.

It costs one-half cent a ton per mile in New York to carry freight, and when the Western road comes here and tells you that it cannot compete with water, and land your flour at its depot in Boston so cheap as vessels can from Albany, we bring you the Hudson River Railroad — a road of easy grades and curves,

running parallel with the river — which is transporting freight at all seasons of the year, summer and winter, and is at this moment sending produce, provisions, and live stock from Troy to New York against the competition of the River; having no less, as Mr. Johnson tells you, than four hundred long freight cars, for which it finds ample employment. But the Western Road, with its high summits, heavy grades and short curves, cannot compete with a vessel that goes 500 miles round to reach Boston. Truly, Mr. Chairman, the old partner is getting superannuated. The younger men can do business a little cheaper, and they ask you for the opportunity.

We have shown you how cheaply freight is transported in New York, by giving the average rates of thirty railroads. The Western Directors cannot compete with these prices; the Troy and Greenfield Railroad can. I don't mean to blame these gentlemen: they cannot help it. They have accomplished much good for this Commonwealth; they have made great cities of Worcester and Springfield, and are doing a vast local good. Let them be praised for what has been done by them, but don't let them say that we, who cut down the height of the mountains, who have less grades and less curvatures, — don't let them say that we shall not have an opportunity to do business.

Do you wish, Mr. Chairman, to build up our metropolis? Do you wish to enable it in some degree to compete with New York, for the mighty business of the West? Adopt, then, the liberal and far-sighted policy of sagacious men. What says New York on this subject? Their engineers have given an estimate of $12,000,000 expenditure to enlarge the Erie Canal, and it is proposed to tax the railroads right and left, to make up this vast amount. And what, think you, do they propose to accomplish with the enlarged canal? Why Sir, the Engineer says that when $12,000,000 are expended, there will be 75 cents per ton saved in getting freight to tide-water. We save by our railroad $3 per passenger, and $2 per ton on transportation.

The influence of that 75 cents per ton, which New York proposes to obliterate, reaches to Ohio, Indiana, Illinois and the mouth of the Missouri. It extends to the almost boundless region of the north-west territory of this nation. Its influence will be as sensibly felt in St. Louis, as in New York city. This is the effect of merely saving 75 cents per ton. If this comparatively small saving will warrant such an outlay, have we not some reason to ask a mere loan, not an outlay of $2,000,000, to accomplish an object four times as great? If it is wise in New York to *sink* so large a sum, for such an object, it is not wise *a fortiori*, for Massachusetts, to refuse these — beneficent citizens, we might call them — who come here to assume the risk and ask to guaranty a loan that will enable Massachusetts to cope with New York for the mighty business of the West.

If the Western Railroad, with inferior advantages, has helped the State to the extent of $100,000,000, shall not we, with superior advantages, be permitted to help it much more? If we give you $50,000,000 of property additional, are we not benefactors to the Commonwealth rather than suppliants? and shall we not pay liberally for the State indorsement?

Let us glance at Boston and the City of New York. Boston has remained comparatively stationary; for the last four years we have not built more than 300 houses in a year. How is it with New York? Miles of stately edifices, of the most costly description, have been erected. It is absorbing the commerce of the country, and why? Are the New Yorkers nearer Europe than we are? On the contrary, we are 200 miles nearer England than they are. The British Provinces are nearer to us by 225 miles. Boston is the depot for the manufactures of New England. What we want, then, is facilities for communicating with the West. Having these advantages, shall we not participate largely in Western commerce?

Is it not in evidence that a road is to be built from Sackets Harbor to

Saratoga? Let me ask you if we are going to have a road like this to connect with, cannot we shift some part of that trade to Boston? What is that business of which we are striving to get a share? The freight between the North-west and the Hudson was last year ascertained to be *three million four hundred and fifty thousand tons, and the annual increase is six hundred and twenty-five thousand tons.* Notwithstanding this fact, it is in evidence that the through freight on the Western road has been receding for the last seven years. It has gradually sunk from one hundred thousand to sixty thousand tons. One tenth of the annual increase of passengers and one ninth of the annual increase of freight only, is received and accommodated by the Western road — not one fortieth of the whole.

Is it not humiliating that Massachusetts should take so low a stand in the progress of business, and the development of the resources of the country? These are great facts, and I am happy that it is in the power of this Committee to lay them before the public. When the people know them, they will rise with one accord, and give their sanction to the measure we propose, and bid the enterprise a hearty God speed.

One or two considerations remain, and one is, the justice which Northern Massachusetts requires at your hands. Our State is forty or fifty miles in width. One great avenue to the West lies on one side; one on the other side of the State. The Northern towns and people have gone on by themselves, and carried their railroad from deep water at the Navy Yard to a point west of the noble Connecticut. They have worked their way by their own unaided energies. And here I may properly allude to the difficulties experienced by the Vermont and Massachusetts Railroad Company. They came here in the midst of their troubles for a State loan, which the Eastern road was ready to relinquish, but they asked in vain. What was the result? — great sacrifices were made to enable them to proceed with their work. I do not hesitate to say that the direct and indirect loss incurred by that corporation, in not having the State credit, exceeded $400,000. They were forced to make a detour to Gardner, also, which made a loss of $300,000 more, all of it incurred by unkind legislation. An opportunity is now given to the State to atone for this injury by granting the prayer of the memorial now under consideration. In their name I invoke the aid of the State for the Troy and Greenfield Railroad.

If we are met by the objection that there is no precedent for this grant, I reply that six or eight cases are enough to make a precedent. Massachusetts has endowed six of her daughters, the seventh remains unwedded. It is urged that Massachusetts has not acted hitherto in this behalf. I answer, it does her no honor that she did not act in the case of the Vermont and Massachusetts road. Let me, I beg of you, call to mind a brief chapter in the history of the last twenty years. Our chaplain at that time was Chairman of the Committee before whom the Western Railroad Company appeared, asking for the aid of the Commonwealth. He held the pen which made the report that gave them a million of dollars. I don't wonder that to-day, they are unwilling to come forward to this table and show themselves, but prefer to keep in the background."

Mr. Whittemore. — "If the gentleman means myself, when he speaks of 'our chaplain,' he has made a slight mistake, in saying I was Chairman of that Committee. I was not Chairman, although I had the honor to sit as a member of the Committee."

Mr. Derby. — "I thank the gentleman for correcting an error into which I had fallen. However, if he did not hold the pen, he cast his vote in favor of the report, and in a Committee of equals, the vote of a member counts certainly as much as that of the Chairman.

This is the second application that we have made. We received on the first

occasion the unanimous approbation of the Committee. But we lost our bill by strong outside influences and for the want of facts detailed in the report. We trust that you will, in the report which we confidently expect, state facts sufficient to answer all possible objections. We know not what measures will be resorted to. We have courted opposition. We have waited for our opponents from day to day, and the time of the Committee has certainly been given to them in very liberal measure. We trust, now, that if you give us a bill, you will give, also, a full conclusive report.

It is urged in the Memorial of the Western Railroad, that we are going to take the traffic from that road; but, according to their own showing, we cannot hurt them much. They tell you that they have important business which will be affected. But if you will deduct the cost of the through passengers and freight, which they estimate at three dollars each from Albany to Boston, or $282,000, and deduct the proportion of the residue which belong to the Boston and Worcester, the net diversion will not materially exceed $70,000, or one-tenth of the net income. But then what is the result of this diversion? Don't we liberate one of their freight depots which pays them little or nothing? Cannot they cultivate their local business, or sell us their freight cars which we shall want? The net loss for their through traffic will not be 1½ per cent. of their dividend.

But let me put the point to you in this way. We finish the tunnel in five years. That period will elapse before we shall, probably, be felt by the Western road. In the mean time, the increase of local business is eight per cent. yearly, or $400,000. This injury which that Corporation sees in our success, vanishes at once; it is seen only by the disordered vision of a narrow-sighted policy; it is suggested by a miserly avarice, which is unworthy to be countenanced for a moment in the halls of enlightened legislation, or by a progressive people.

It is objected, again, that the State may lose her loan. Is it so? Look at the sinking fund. It amounts to-day to $1,200,000. In five years it will amount to $1,800,000, and it will soon extinguish the debt. The State don't incur a fraction of risk. Then we are forewarned that the stock of the State will not be so valuable. Is the possible but improbable loss to the State of 1 or 1½ per cent. dividend of such magnitude as to weigh down the great advantages which this enterprise will secure?

But there is another view to be taken of this subject. Whether we take the through traffic or not, the Western Railroad is fast losing it. It is rapidly diminishing, and before long, will have entirely disappeared. The objections to our memorial come chiefly from local feeling in Springfield. Let no petty jealousy of towns interfere with this great enterprise; throw out of the consideration of this case all such objections, and permit them not for a moment to influence your minds in the decision at which you may arrive.

I have before remarked, we live in a progressive age. The State that does not progress is receding. Our shipping has increased from 1,100,000 tons to 4,000,000, in twenty years. Our manufactures of cotton have risen from 126,000 to 641,000 bales consumption, in the same time. Our iron has increased from 165,000 tons in 1830, to 627,000 tons in 1850. But the unexampled West has progressed with still more wonderful strides. From a population in the North-Western Territory of 271,000 in 1800, it increased to 699,000 in 1810; 1,423,000 in 1820; 2,298,370 in 1830; 4,131,370 in 1840, and 8,000,000 in 1850. The little germ has expanded to a great nation, and it is yet in its infancy.

There is another fact which I will recall to your minds. When the Western Railroad was established, the freight passing to and from the Hudson River amounted to 600,000 tons annually. It amounts now to 3,500,000 tons. The enlarged canal is building this trade up to 10,000,000 tons annually.

If the rest of the world is in a state of progress, are we to be contented to re-

main stationary? If Virginia pierces the Blue Ridge; if Baltimore reaches the Ohio River through seventeen tunnels by one route and fifteen by another; if Pennsylvania is breaking through her mountains, and throwing out of use her inclined planes; if New York, glorying in her low grades, boasts that she can, although at a greater distance from the West, cope with those that are nearer by breaking down the price of freight 75 cents on a ton, is Massachusetts to slumber — to sink into inaction? Is she to lie down quietly and let the monopoly of the Western Railroad rest like an incubus upon her future? Shall that corporation compel this great State — great in every thing but territory — to stand idly by, and see others win the race? We do not believe that such is to be our fate.

I stood lately on the field of Bennington, in the valley of the Hoosac, where our fathers drew the sword and shed their blood to protect their homes and firesides, and in defence of their most sacred rights. Thank God, we have inherited a different fortune. Our field of battle is the field of science. In the old war with Britain, Massachusetts led the van, and hurled defiance to a mighty empire. Before entering her new field of battle, she has sharpened her native intellect in schools, institutes and colleges; she has disciplined her mind; she has taken the lead in the fisheries and in navigation, in every ocean; she has distinguished herself in the mechanic arts; she has risen rapidly to wealth; she has conquered both in war and peace; she leads the van now, and has led it. In canals she set the first example; she built the first railroad. Her manufactures are to her a mine of wealth, and her industry is developed in every channel; and must she now, when every thing is so bright and full of promise before her, be bound down to a narrow and ruinous policy by the fiat of the Western Railroad? God forbid! If this is to be our fate, we may well say in the terms of the old proclamation, '*God save the Commonwealth of Massachusetts.*'"

Tuesday afternoon, April 5th, 1853.

The Committee having voted to give the Western Railroad Corporation a further hearing in consequence of the absence of their counsel, Mr. Phelps, from the two previous meetings from indisposition, met in the Senate Chamber at three o'clock, P. M. Mr. Clark in the chair.

Mr. PHELPS, after apologizing for the delay caused by his absence, remarked that he should make no extended opening, and proceeded to read the first part of the printed memorial, which was discussed by Mr. Keith in his closing argument.

He then called Capt. WILLIAM H. SWIFT, who testified as follows:

"The report of Messrs. Whistler, McNeill, and myself, as to a tunnel on the Western Railroad, was for a tunnel in place of the summit cut at Mount Washington, not far below the surface. The question was simply one of time and expense. The whole cut is about half a mile. This took two or three years, as well as I remember.

An estimate made for that purpose would not be applicable to an excavation like that proposed for the Hoosac, because the one is near the surface, and the other many hundred feet below the surface. The Canaan Tunnel is about 560 feet long. It was built by Mr. Rutter. He was about one year in the work. I infer from the report of the Baltimore and Ohio Railroad Company, their tunnels cost more than the original estimate. Have seen some of the European tunnels, and have made memoranda with regard to their cost. The Kilsby Tunnel is one mile 3.10 long; is on the London and Birmingham road; has two shafts, 102 and 132 feet deep, respectively, and cost $619 per lineal yard. The Box Tunnel is 1 83.100 miles long, through red sandstone and earth. It has 13 shafts from 80 to 306 feet in depth, and cost $1,600,000, or $500 per lineal yard. The Rochdale Tunnel, on the Manchester and Leeds road, is 1 63.100 miles long; it has 14 shafts 51 to 321 feet deep, and cost $1,255,000, or $438 per lineal yard.

The Blechingly Tunnel, on the South-Eastern Railroad, is 3-4 of a mile long, through sand-rock; has 11 shafts, 53 to 93 feet deep, and cost $476,000, or $360 per lineal yard.

The Saltwood Tunnel, on the same line, is 954 yards long, 90 feet below the surface; has 12 shafts, and cost $562,700, or $590 per lineal yard. This tunnel is built through loose sand.

The Blaizè Tunnel, on the Paris and Lyons Railway, is 2 56.100 miles long, and has 21 shafts. During the year 1847, from 3000 to 4000 men and 12 steam engines of 20 horse power, were employed upon it. It cost $1,870,000, or $415 per lineal yard.

The Chesapeake and Ohio Tunnel is 3180 feet long, and has two shafts. Depth not remembered. It cost $700,000, or $674 per lineal yard.

Taking the average of the five English tunnels, they have cost precisely $500 per lineal yard. At this rate, the Hoosac, which contains 8033 lineal yards, would cost $4,016,500.

I made estimate of cost of working different railroads in New England, referred to in the Memorial. Have not compared these roads as to grades and curves, with Troy and Greenfield Road. Have examined cost of carrying passengers and freight per mile on New York roads for last three years. Average cost per passenger, $1.26; per ton of freight, per mile, $2.83.

The cost of carrying a passenger on Long Island Railroad one mile, the past year was $3\frac{43}{100}$ cents, which was more than they charged for fare. The cost on the Utica and Schenectady was $\frac{49}{100}$ of a cent. The average cost per mile per passenger on 19 roads in New York, is $1\frac{43}{100}$ cent.

On next page of Mr. Alpine's reports I find average cost of carrying freight on 19 roads is $2.86 per ton per mile, the maximum being on the Buffalo and Niagara Road with the minimum on the Erie of $\frac{63}{100}$ of a cent per ton a mile.

The cost of carriage is sensibly affected by the number of passengers and number of tons carried. A full train and full freight will make the cost a minimum.

The average number of through passengers from Boston to Albany for the last 11 years, on the Western Railroad, is 29,455 per year. The cost of that portion of the Western Railroad west of Connecticut river, is about $7,000,000, total cost rising $10,000,000. There have been 17 dividends, averaging $5\frac{1}{2}$ per cent. per annum since 1842. Length of Hudson River Railroad, from New York to Greenbush, 145 miles; Harlem Railroad, 153 miles. The Western Railroad could carry from 1,200,000 tons to 1,500,000 tons per year. Have an assistant engine at the summit. Pittsfield and N. Adams Railroad cost $450,000 — pays but about five per ct. on cost.

There is a project to construct a tunnel under the Hudson at Albany, to connect the Western and other roads east of the river with the Albany and Schenectady west of the river. The estimated cost is from $700,000 to $1,100,000. Width of the river 1300 feet. Amount of fuel consumed by 20 ton engine from Pittsfield to Springfield, 50 miles, 3 cords; from Springfield to Pittsfield, $2\frac{1}{2}$ cords; from Springfield to Worcester, $2\frac{1}{2}$ cords; Worcester to Springfield, $1\frac{3}{4}$ cords. The bulk of freight is eastward. Many cars go back empty. Amount of flour exported to Great Britain from New York, in 1852, was 917,995 bbls.; from Boston, 37,011 bbls.; bushels of wheat from the former, 1,933,319; from the latter, 18,135."

Cross-examined.

"The highest grade from Albany to Pittsfield is 45 feet; the road is undulating. There are a number of grades ranging from 35 to 45 feet. East of Pittsfield there are 5.55 miles of 75.5 feet grade. From Springfield to Brookfield there are grades from 60 to 66 feet. From Brookfield to Charlton, east the grade is 49 feet, west it is 48.5 feet. There is one curve of 910 feet, one of 882 feet, and one between West Stockbridge and Greenbush of 859 feet, no others less than 1000 feet radius.

We have four classes of freight; price for 1st class from Albany to Boston is $7; 2d, $5; 3d, $4; 4th, $3.20. Flour and breadstuffs included in 4th class. Suppose flour was carried over our road for 28 cents per barrel last year. The cost of transit across the Hudson, from our road to Schenectady, is 25 cents, exclusive of loading and unloading. There was a thorough cut in rock on our road before we reached the tunnel, of one hundred feet or more on each side. The rock was very hard, its character gneiss, — cost $1.25 per cubic yard, to excavate it. I selected English tunnels of greatest magnitude for my computation. The Kilsby is one of the earliest railroad tunnels, the shafts are *sixty* feet in diameter, size of the tunnel is about 28 feet by 30 feet. The shafts in the Box Tunnel are large, the diameter is quite large, being for wide-gage track; can't state the area, larger than common tunnels, perhaps 30 to 39 feet in diameter. Can't give the area of Rochdale Tunnel, was large however. All the English tunnels I mentioned are lined with masonry; the tunnel on Western Railroad is not lined.

The contractors on Baltimore and Ohio Canal may have taken their pay in bonds at a large discount. The canal was largely embarrassed and depressed. I obtained General Bernard's estimate for tunnel through Alleghanies, from his report. Don't know the area; it was for 120 ton boats. Canal 60 feet wide; don't remember the estimate per cubic yard.

I have no description of Blaizè Tunnel — quite similar to the Nerthe. Have not conferred with European engineers, as to cost of tunnels at the present time. Never made a tunnel. In tunnels I enumerated, I simply gave the length, without area, and cost per lineal yard.

Much of the freight on Fitchburg Road has a short run, frequent loading and unloading, that adds to cost of transportation. Fuel for the Western Railroad cost this year, $2.95 per cord, on whole road, obtained principally on Berkshire hills; price at Charlton $3 to $3.25.

In the body of McAlpine's report, he gives the cost of carrying 1000 passengers one mile, at 4.62 mills per passenger, and for carrying 1000 tons of freight one mile, at 7.81 mills per ton. There is great difference between this statement and table N., the one I quoted. Increased curvature increases the cost of carriage, and diminishes the safety. A curved road is more dangerous than one without curves. Cost of Western Railroad between Worcester and Springfield now, should say, at least, $2,500,000, exclusive of motive power; a double track, for 44 miles, whole cost of motive power and equipment about $1,000,000. The estimate of the cost of the tunnel under the Hudson, includes land damages. Should begin to descend to the tunnel back half a mile, say 2600 feet, would require a grade of 100 feet in tunnel, would be 80 feet below present tract. Should have to descend a grade of 100 feet, and ascend a grade of 100 feet. It would be 80 feet below present track. The Albany and Schenectady Road has a grade of 80 to 90 feet. The want of a bridge at Albany is an inconvenience. There would be a level grade in the tunnel under the Hudson of 400 to 500 feet. The State of New York authorized all roads interested to subscribe five per cent. of their stock to it. Western Railroad could afford to put into that tunnel $400,000. We are sometimes interrupted by ice at Albany, and that is one reason why we want a tunnel. In making a tunnel under the Hudson, think the water can be controlled.

Can't say whether agents of the Western Railroad circulated remonstrances against the grant to Troy and Greenfield in 1851. Don't know that I can state whether the Western Railroad paid any money for such purpose in 1851. Don't know whether they paid any money or not."

Direct examination resumed. — "The practical difficulty in tunnelling is met with in the water. The Kilsby was once abandoned on this account. 3,000,000 gallons were pumped out daily, and in the Box Tunnel 4,000,000 gallons. The practical difficulty at the Hoosac Mountain, I apprehend, will be from water. The position of the rock is favorable to percolation. Ventilation of it is practicable, by means of blowers."

William R. Lee, called by Mr. Phelps, testified. — "Was before the Committee in 1848; am Superintendent of Boston and Providence Railroad; have been for twenty-seven years a Civil Engineer.

The difficulty in the Hoosac Tunnel will be water percolating through the arch and sides of the tunnel; think it will be a serious difficulty. The rock being in vertical strata, as it is opened will admit water. Cannot say to what extent. The effect of water percolating through the roof, would be to make it unsafe without arching. There would be more difficulty from water in the shafts than in the tunnel. Do not mean to say the tunnel is impracticable. Time required will be increased by length of haul in taking out rock. My estimate for the tunnel was three millions, and the time I set ten years. That estimate was not made up from any particular knowledge I had on the subject. I estimated $325 to $350 per lineal yard, and made the estimate upon hand labor and blasting, as no machine was then in existence.

If there was considerable business on Western Railroad, I should think the saving in fuel on the down grade would compensate in part for running from Pittsfield up, with an assistant engine. A steady grade with one summit, is more favorable than an undulating grade with several summits.

In 1850 I sat on a reference as to Baltimore and Ohio Railroad. The subject of cost of tunnels came before us. Mr. Latrobe gave us notice we must disregard the estimates. The character of the rock was laminated slate, and estimates $3 to $3¼ per cubic yard; all the tunnels but one were on Baltimore and Ohio Railroad. I was impressed with the idea that tunnels were uncertain to estimate upon. Think it would be difficult to estimate cost or time of making the Hoosac Tunnel. Based my opinion on cost of constructing English tunnels and the Black Rock Tunnel."

Cross-examined. — "Do not recollect all the English Tunnels on which I based my opinions. The Box and Kilsby were two of them, and there was one Canal Tunnel. I consulted books. Have never constructed a tunnel. Have superintended the running of Boston and Providence Railroad for twenty-two years. Was assistant engineer on the Boston and Providence Railroad when it was built; have since made some branches on it to Dedham, Pawtucket, &c. In 1829 left West Point; served as assistant at the South two years; then in 1831 came on to the Providence line, and have since been either assistant engineer of that line or its superintendent. Have never visited the Hoosac. Get my idea of the rock from Hitchcock's Geological Report.

Gneiss is harder than mica slate. The Pulpit Rock Tunnel was not quite as long as Black Rock Tunnel, both on the Reading Railroad. I was with McNeill and Whistler after I left West Point.

Should consider it a great object to cut down an elevation or summit six or seven hundred feet on a railroad which is a candidate for a large amount of freight. It would make a saving to the carrier. The effect of cutting down the summit and reducing grade from 76 to 39 feet, would be, that an engine would carry *two hundred* tons instead of *seventy-five* to *one hundred*. Consider the avoidance of curvature very important, even more so than saving of grade, or if made at expense of grade. I did not regard the machine; when I made my estimate, it was not built. Going over the mountain would not add to the value of my opinion."

Wm. P. Parrott. — "Has made some examinations of tunnels. I have the details of the cost of Pulpit Rock and Black Rock Tunnels. Pulpit Rock Tunnel cost in the aggregate $4.64 per cubic yard. The cost of excavating the Black Rock Tunnel was $5.80 per cubic yard. In my opinion it is difficult to judge of the cost of a projected tunnel, by the cost of tunnels already constructed, since every tunnel must depend upon its own accidents. If shafts are required it involves expense, and the amount is uncertain. I observed the character of the

country approaching the Hoosac Mountain, and should suppose the road would have to cross the river frequently."

Cross-examined. — "I only observed the route of the road as we passed along in the sleigh. Have not spent all my life in engineering; have not built any tunnels."

Henry Gray, Master of Transportation on the Western Railroad. — "We have heavy trains in September, October, and November; but little use for equipment at other times. Get our flour mostly by Canal. The canal-boats are towed over the river to freight-house, and the flour raised into the depot. Have had but little freight through the Champlain Canal of late. Freight comes from Troy to Greenbush, six miles, and goes over our road in same cars.

The competition with our road is by packets from Albany to Boston; through the Troy and Rutland road and the Ogdensburg road. Local business affected by New London and New Haven and Housatonic roads. Before Troy and Burlington roads opened, we supplied the whole line of the Vermont and Massachusetts road. Ogdensburg road, of late, has supplied Worcester to considerable extent with flour. Competition for Saratoga travel by Rutland road, which is six miles shorter. Mr. Gray reads a table of distances."*

Cross-examined. — "In 1840, on the 60 feet grade east of Springfield on the Western Railroad, a train got the start of the men, and came down the grade with great violence, went through the side of the freight-house, and killed five men and destroyed the engine. In 1842, on a short curve in Russell, two engines and trains came in collision, head on, the engines were demolished, a large number of persons were badly injured, and two died of their injuries. These accidents generally occur at short curves.

I can't tell how much our freight averages per ton; think our through freight might average a little over three dollars per ton. We get but $4 for through passengers to Buffalo, and $5 to Albany. Half pay to Albany. The Providence and Worcester road is a benefit to the Western road; also the Hartford and New Haven road. The New London road takes from us rather more than it gives. Passengers have been ticketed from Albany to New York over the Harlem road, which uses 22 miles of the Western road, at $1 to $1.50. They carry freight over same road to New York at $3 to $3.50 per ton."

Thomas L. Green, Agent of the Western Railroad at Albany, testified. — "That flour is taken to New York from Albany, in the summer season, for an average of 7 to 8 cents per barrel by the river, in canal-boats and packets. Takes from 20 to 24 hours in the transit. Can discharge from the ferry-boat at Greenbush into Western road depot about 30,000 barrels per day. Depot is 750 feet by 45 feet. Used to have large freight from Champlain Canal, 2,000 tons in 1847; none now. Canal-boats have been towed down to New York for $2.50 each."

Cross-examined. — "We have some obstruction in crossing the river at Albany when the ice is going out. Have delays of a few hours sometimes. Passengers have not been delayed the past year. Takes half an hour to cross and take the cars. Harlem road has taken considerable freight the past winter; it carries most up the river, the Hudson River road the most down. In lifting flour from canal-boats into depot have to raise it 20 feet by a steam engine; we have thirteen places to raise it. Usual price of freight down the river is $1 to 75 cents per ton. The ferry-boat at Albany costs the Western road $20,000 to $25,000 per annum. It is said the Hudson River road is preparing to do a large freight business to New York this season."

Mr. Williams, Freight Agent of the Boston and Worcester road. — "The Pennsylvania and Baltimore and Ohio Railroads have agents now in Boston contracting to take freight that has formerly gone West by the Western road. They offer to take dry goods to Cincinnati via Philadelphia and Pennsylvania roads at

* The table not having been furnished to reporter, cannot be given.

$1.45 per hundred. Packets take freight to Baltimore at four cents a foot. Can take it cheaper than it can be carried by Western Railroad."

Wednesday, April 6th.

At the commencement of the session, Mr. PHELPS, for the Western Railroad, read extracts from the proceedings of a Convention of Northern Railroads, in reference to rates of fare for passengers and freight, and extracts from Mr. Derby's remarks on that occasion; after which he called Mr. Green to one point, the rate at which flour is taken from Albany to Boston, by water, which is 15 to 22 cts. per barrel, exclusive of insurance and wharfage.

Mr. DERBY then called as rebutting testimony, as to the cost of tunnels, Mr. Otis Clapp — "I put in a list furnished me by the Engineer of the Baltimore and Ohio Railroad, signed Feb. 12, 1853, of the actual cost, not estimates, of sixteen tunnels, on that road, which makes the highest cost per cubic yard at $3.87½, and the lowest $1.75 per cubic yard, average cost $12\frac{60}{100}$. The cost per mile of the Western section of that road, from Cumberland to the Ohio River, about 200 miles, including tunnels, was $33,158 dollars per mile, while the Erie road cost $43,334 per mile, and the Western road about $58,000, exclusive of equipment.

The report of the Baltimore and Ohio Railroad Company shows that the cost of their road including tunnels, exceeded their estimates by less than $500,000, and the cause of this excess is attributed to mountain slides of earth, cost of right of way, law and legislative expenses, drainage, &c. The report does not mention any tunnels exceeding in cost the estimates."

P. P. F. DEGRAND was called in relation to the summit cut on the Western road. — "I remember that, as a Committee man, I was passing over the line of the road in company with Mr. Derby, who was Chairman of the Committee, and here learned that workmen were engaged only upon the eastern side of the cut. Mr. Derby suggested the idea of working both ends. This was strongly objected to, but, after some delay, was carried. The result was, they saved one year in time, and $300,000 interest money, by finishing the road so much sooner. The Western road is indebted, in my judgment, to my friend, Mr. Derby, something like half a million of dollars for his valuable suggestion. It was and is now, my opinion, that that amount has been saved through his means.

My idea is, that in competing with New York for business, we must go to the lowest living figures in our charges. I thought that on the Western road we could afford to go as low as 25 cents per barrel for flour from Albany to Boston in the summer season, and a trifle more for the winter. Passengers I would have carried for $2 each, if my counsels could have prevailed. There are always a large number at Albany seeking tide-water, and the question is, Shall Boston get her due proportion? At reasonable rates of fare, Boston would probably receive of all the passengers from Albany, at least one third. For myself, I wouldn't have started a peg in urging forward so great an undertaking as the Western Railroad, if the object was to carry only the petty number of 34,000 passengers annually. It would not have inspired me or any one else with enthusiasm."

Mr. JAMES HAYWARD was recalled in reference to the five English tunnels named in Mr. Smith's testimony yesterday. Mr. Hayward: — "In my opinion talcose slate is as good rock as any to stand in a tunnel or to make a roof of. The area of the Box Tunnel is about 30 feet by 40 feet; one statement makes it 39 feet by 33 feet. The area is nearly three times the size of the Hoosac Tunnel. There are eight working shafts upon it, 25 feet in diameter. The shafts are six to seven times as great as those now used. 2700 feet of this tunnel were built through oolite rock, the rest was through spongy earth and quicksand, which was very difficult of excavation on account of the water and sand pressing in from sides and roof. It is manifest it would cost a great deal more to take out a lineal foot of this than a foot of the Hoosac Tunnel. The

Kilsby Tunnel was made through a spongy formation and a large amount of quicksand. The shaft was *sixty* feet in diameter and lined *three feet thick with brick.* It was with great difficulty they could proceed at all, owing to the quicksand. It was so soft and spongy that it fell in, once to the length of 70 yards, after the brick work was up."

I have no special description of the size of the Rochdale Tunnel. It was built in 1838, and built *lower than the canals.* The geology of that section of the country, is sandy loam and sand. The Blechingly Tunnel is 30 feet by 30 in area, and lined by a brick wall three feet thick. The Saltwood is the same in size as the Blechingly. In the earth through which the latter is constructed, the strata lay in heaps, dipping in all directions, and there was a large quantity of water. Since the Rochdale Tunnel was built, there has been a tunnel built near it of *twice the length, for half the cost.* It cost more to tunnel through clay and quicksand than through rock, on account of the water and the masonry for arching and lining."

Hawkes Lincoln called.—"I have charge of the freight station on the Fitchburg Road. Our engine will take on the Fitchburg Road 50 short or 25 long freight cars at once. If we had 200 such cars to send daily, we should send four such trains daily."

Mr. Edwards recalled.—"I think there can be no doubt that the rock in the Hoosac, the talcose rock, is sufficiently hard to sustain the roof of the tunnel. It is such rock as we use for arches. I have made ample provisions for the water in my estimate of the cost. The grade in the tunnel under the Hudson must be more than that given by Capt. Swift; as the fall is 80 feet in half a mile, the grade must be 160 feet to the mile. The report of Daniel Treadwell and Nathan Hale, as Water Commissioners to the city of Boston, is printed. From that report it is their opinion that a 21 inch pipe, with a fall equivalent to the fall of the grade in the Hoosac Tunnel, would discharge 6,000,000 gallons per day, and that a steam engine with such a pipe attached, would pump 2,500,000 gallons in 20 hours, or two engines 6,000,000 in 24 hours. There is a mistake of 20 miles in many of the distances given by Mr. Gray in his table. In Gen. Bernard's estimate of the cost of a tunnel through the Alleghanies, cited by Capt. Swift, the total estimate for *excavating* the tunnel was but $949,983.79; the other estimates, making the total over three millions, were for masonry. The cubic yards in that tunnel were to be 473,973, while the cubic yards in the Hoosac Tunnel are but 361,500. The area of that tunnel was 45 per cent. greater than the Hoosac.

The cost of the wood at Rice's on the Troy and Greenfield Road, is about $1.50 per cord."

The testimony having closed, Mr. Phelps commenced his closing argument for the Western Railroad.

ARGUMENT OF MR. ANSEL PHELPS.

Mr. Phelps commenced by saying, "I have been informed that the question has been asked, and that, too, by members of the Committee, 'Why the Western Railroad opposed the prayer of these memorialists; how it concerned them, and what business they had here, at the hearings before the Committee.' I have also heard that, although I left other business to attend the journey of the Committee over the Hoosac Hill, my presence there was regarded as an unwarrantable interference on the part of the Western Railroad, and it was telegraphed to a Boston paper, that the counsel of the Western Railroad had no business there. I would ask in answer to all this, is not the Western Railroad properly here? The Commonwealth owns $1,200,000, and is interested in more than half of the whole amount which is invested to do railroad business between the Hudson River and the metropolis of Massachusetts.

Gentlemen of the Committee, what is the charge that is brought here against us in aid of the memorialists? It is this: In consequence of the heavy grades, sharp curvatures, and high tariff on our road, we have failed to accommodate the business we were constructed to transact. Gentlemen, the memorial begins with a writ against the Western Road, precisely in the same form as is used in a slander suit, and they will probably get from the Legislature as much as is ordinarily gained in a suit for slander.

No, Gentlemen, we are here properly, and being so, I was somewhat amazed at the course pursued in this hearing during my absence, and must confess I thought there had been some little want of courtesy on the part of the petitioners, in prosecuting the hearing under the circumstances."

Mr. DERBY. — "I wish to set the matter right here. The hearing had already been delayed some weeks. It was understood at the last week's session that, although the Chairman could not be present after Monday, the hearing should proceed."

CHAIRMAN. — "There was no vote taken on the question. I did state that my colleague, Mr. Davenport, and myself, would be engaged on another hearing after Monday, and something was said about postponing the present cause. My own impression was that this hearing would lay over, although, as before remarked, there was no vote taken on the question."

Mr. DERBY. — "The chair will recollect that this matter was discussed, and a free expression of views was given; that we, having heard them, said, much as we would regret the absence of the chairman, we must still urge forward the hearing as rapidly as the Committee could give us their attention. We were fearful of losing our bill by further delay, and the Committee voted to proceed on Monday."

Mr. PHELPS. — "I have been accustomed to regard the words of the Chairman as the voice of the Committee, to look upon him as its mouth-piece. I must still say, I thought the course pursued, the most singular treatment I ever received.

At the first meeting of our Committee, I listened with great pleasure to the eloquence of the learned gentleman who presents the case for the petitioners. In my judgment he made the most of his case, and it stood then stronger and better than it now is, after the evidence is all in. I regret, however, that any remark of mine on that occasion should have been construed into a sneer, but that regret was somewhat mollified by the noble burst of eloquence which it drew forth from his lips. I beg leave now to state, once for all, that I did not come here to sneer at this project or his arguments. Any enterprise, the consummation of which will be productive of such great results, is not to be put down by sneers. No, gentlemen, nor is it to be sustained but by facts — facts that will stand the test of rigid examination, and unless they bring you these, upon which to base your judgment, they ought to fail.

There is another remark made by the counsel, to which I will here advert. He said, 'I look along the Committee and see no familiar face,' and closed by saying it could not be said they had packed the Committee, — rather a strong intimation, I thought, that somebody had packed it. Did the President of the Senate or the Speaker of the House, so far demean themselves as to pack the Committee? Did the Western Railroad or its counsel do any thing in this connection? Are you here as a packed Committee? I think not. There can be but one answer to that insinuation; it is entirely gratuitous and unfounded. Gentlemen, I came before this Committee not knowing any one of its members. As attorney, it is no part of my business to pack committees. I compare them to intelligent and conscientious jurors. Had I seen so much of the wickedness of the world as my brother has, I might have been as suspicious as he, but I have not, and I preferred to rely on the Committee in my trusting confidence.

But I proceed to the consideration of some of the reasons why the prayer of these petitioners should not be granted. And here I will repeat that sneer — if it was a sneer, — That the whole subject has to me an 'ancient and fish-like smell about it.' It has occupied my attention for months. I have passed weeks before committees on this subject, written weeks upon it, talked weeks, and, I might almost say, have dreamed weeks upon it. I have seen in my dreams men toiling in the mountains for long years ahead, and imploring further aid from Massachusetts.

In 1848, the Troy and Greenfield Railroad made an application for a charter. The hearing was a tedious one, lasting six weeks. The gentleman [Derby] has remarked that the report of the Legislative Committee was defeated in 1851 under rather peculiar circumstances. I may remark that the bill, in 1848, was passed under rather peculiar circumstances, — by a rush through both branches of the Legislature. It was a year when many people, to use a familiar expression, had a good many axes to grind. The Troy and Greenfield Railroad were in the field with a strong force of numbers. I alone represented the Western Road, and in my innocence retired relying upon the report of the chairman. I will not say that 'while I slept the enemy sowed tares,' but I do say that in the House, the chairman was allowed about fifteen minutes to express his views, and that the same courtesy was extended to Hon. Mr. Nelson in the Senate, while the friends of the bill were allowed ample time — and so the bill passed.

I recollect well the arguments that were used at that time. The friends of the bill said we are aggrieved; we helped the Western Road; we were in favor of it; and now, when we come to build a road with our own money, we are opposed. All we ask is to build with our own money. Five years have now elapsed, and I ask why have they not built this road with their own money? Within that time fifteen thousand miles of railroad have been built by private capital. Boston alone, within that time, has invested tens and tens of millions of dollars in other enterprises. If this was feasible, why has not this attracted their attention? In three years they had expended but $56,000, and in 1852 the expenditures had arisen to but $81,000. Why this result? It is not for want of interest, zeal, or capacity on the part of those who are interested in this project. I know most of the gentlemen who have undertaken this measure; I was raised among them, my kindred are there, and I will say, search Massachusetts through, and you will find no men more competent to carry through a reasonable, yes, I will say desperate, enterprise than they.

I had supposed that no honorable means would be left untried to press forward that enterprise. Here are 2,400,000 tons freight, waiting at the Hudson River to be transported to tide-water. I had supposed that State street would bite at once at this tempting bait. I had supposed they had done all that could be done to accomplish their purposes. In 1851, when they came here for the State credit, I then supposed it was because State street and capitalists had no confidence in this enterprise; because they thought even if it ever were constructed, the competition would be so great as not to be remunerative.

Gentlemen, I am forced to give up these conclusions, in consequence of what my brother on the other side has told us. He told you the question might be asked, why they had not gone on without this loan. It was, he answered, that they might not be obliged to sell their bonds at 85 per cent. Looking at the fact that millions have been subscribed since this charter; that Massachusetts has made no State grant since 1841; looking, too, at the fact that railroads are no longer of doubtful expediency, they ought to go upon their own capital and credit, and not seek aid of the State. No week passes in New York city, that bonds are not sold for 85 or 90 per cent., and I submit that, if the Troy and Greenfield Railroad are forced to sacrifice even $300,000, they ought to console themselves in reaching sooner the great West, where they will be overwhelmed in business.

Well, gentlemen, since 1851, two years have elapsed. If this enterprise is so feasible, why have they not undertaken to prove that what they say is true? Why do they not go into the tunnel, and sink the shaft? Can't they raise money enough to make the experiment? Let them make the experiment. Let them, before they ask Massachusetts to do what she has not done since railroads were in their infancy — show, first, that a great public benefit is to be secured, and secondly, make a demonstration before they ask.

Well, they tell us they have made an experiment, and what is it? Is the mountain perforated at all? No mark has hardly been made upon it. We heard, in 1851, of a great deal that might be done with a machine, and a new mode of drilling. I recollect that this machine was to open a new era in rock excavation. Its march to the mountain was announced in bulletins with as much pomp and ceremony as Napoleon's Grand Army. Hoosac, if it was instinct with life, and possessed a particle of credulity, must have trembled at its base. The mountain was reached in June last, the steam was applied, the wheel revolved, and the cutters broke. The steam was applied again, and the cutters broke again. You have been there, and have seen what has been done in the way of going into the mountain since 1851. You have all heard of the fable in Esop, how, after mighty spasms, the mountain brought forth a mouse. Gentlemen, in looking at the achievements of this machine, you have seen how infinitely trivial is the work performed to what it must do. I have been of the opinion that this is one of the very cases Esop must have had in his mind when he wrote the fable.

In 1851, the machine had made no demonstration, but its friends made many promises. They have done — you know what — next to nothing. The Troy and Greenfield Railroad do not own the machine, but they have paid $1,200 towards grooming the animal for the amusement of the Legislature — that is the evidence. So that since 1851, they have done nothing, and they come here now in a worse position than they were then. They have promised much, but done nothing.

When the Western Road was started, Boston capitalists were willing to take hold. There were no avenues then to the West. Berkshire was a foreign province. The Hudson was as far off as Havana. Under these circumstances, Boston capitalists were willing to put their hands in their pockets and subscribe one million of dollars.

They ask you to show a confidence, when they have shown none themselves. They ask you, Mr. Chairman, to loan them a hundred thousand dollars to buy a wooden nutmeg with, and then offer you the nutmeg for security. They ask you to mortgage the houses and farms of Massachusetts, to do what shrewd and sagacious men have refused to do.

The gentleman says, that the exigency of the tunnel was determined upon when the charter was granted. Is there in this case such an overpowering, irresistible exigency shown, that Massachusetts should grant two millions to help, with contingent millions to finish the enterprise? Where is this exigency? What is it? Will it accommodate a large amount of business? Will it build up thriving towns and villages? If you find these great questions answered affirmatively, you will have arrived at the conclusion that the road is to be built by somebody.

Let us consider first, the amount of local business that is now unaccommodated, and secondly, the matter of exigency as connected with the through business. The road to Greenfield, some 105 or 106 miles distant, passes through Middlesex, Northern Worcester, and Franklin counties. Radiating from that point are some half dozen roads reaching to the Canadas and all parts of New England on the north. On the south are two or three more railroads. The map and your own knowledge of the country show what the facilities for business are, as far as Greenfield. There is an outlet every where. By the northern lines, western products are brought at an expense which defies competition. Three-fourths of the through travel goes beyond Albany and Troy.

Passing westward from Greenfield, we come to a track of country requiring consideration. In Deerfield you have nothing. You then reach Shelburne Falls, with its population of 1800, and its considerable factory of cutlery. I know of no other important factory in that place. Then you come to Charlemont — on either side are tiers of agricultural towns. Beyond Charlemont there is nothing. A railroad to Sherburne Falls will accommodate all Franklin West. The population is not large ; the towns are thinly settled ; the people are agricultural, and they do not, therefore, require much intercourse with any of the large market towns. When the Western Road was built, the idea was that it would be a great trunk road. The population on the line was a small consideration.

I submit that there is no local exigency to justify a grant of two millions. A road to Shelburne Falls would accommodate fully all the local business, and that can be built by private capital. If it can't be so built, it is the best evidence you can have that the line is not wanted. Passing on from Charlemont, you come to Florida, upon the mountain, several hundred feet above your tunnel. But how is Florida to be accommodated ? Is the suggestion of Colonel Crocker to be carried out, that the potatoes may be dropped through a shaft into the tunnel ? On the other side of the mountain you come to North Adams, there you find a road eighteen miles long, a road that has never paid six per cent. on its cost. On the completion of the road to Troy, North Adams will have another direct outlet to the West. I submit, that so far as Northern Berkshire is concerned, it is already amply accommodated. So much for local accommodation.

Is this road wanted for the through business ? It would seem to be an insult to the good sense of the Committee to offer one word on this subject. The claim on their part is that the Western Road can't do the work, that Boston is losing her share of business, on account of our great curves, high grades and distances. They contend that the road is wanted, and will develope an immense business. Gentlemen, the great question is, is there any business that has not got a cheap, abundant, and easy communication already ? You have the water, a very strong and powerful competitor ; packets, all competing with the Western Road, bring flour to Boston cheaper than the Troy and Greenfield Road can bring it. You have the Western Road, with a capacity to transport 1,200,000 tons, or twelve million barrels of flour, which is one-half of the entire quantity of freight to be carried, and more than twelve times as much as was ever received in Boston in one year by water, or any other source.

In addition to this, you have the Ogdensburg Railroad, capable of carrying twelve millions of barrels more. These two roads have a capacity for the entire freight seeking tide-water, and both are sharp competitors.

The Western Road carries freight low, it is forced to do so ; it can't do otherwise on account of the competition it already has to contend with. Considering the testimony of our Master of Transportation, who has been upon the road since it was opened, I don't care a fig about all their evidence of curves or grades. Their road may be a trifle shorter than ours.

In the matter of exigency, then, I say none is established. The road is not wanted for local accommodation, and none is wanted for the through business. Look at the amount of travel, and say whether there is not already sufficient accommodation for all the business.

You have had various views presented to you, as to the probable cost and length of time required in making the Hoosac Tunnel. You have had works testified to by Capt. Swift, and a general result has been obtained. That, as compared with Hoosac, would give its cost, $4,016,500 ; but you cannot take even this large estimate as the cost, because these tunnels are very different in their characteristics. The difficulty in tunnel work is, that all estimates must be mere conjecture, and are not of the least importance. They are so utterly conjectural, they are not entitled to the least consideration.

There is one other feature which it is usual to consider in matters of public exigency in building a new road, and that is, its effect upon existing roads. The Western Road is already hemmed in to its own line. Putting in another line would be simply dividing the business to two lines, which can be done twenty times over by one line. Either that result — dividing the business — would follow, or one road would be bought up by the other, as is the case in New Jersey, taxing the public with the interest of thirteen millions instead of four millions. Such results have invariably followed where two directly competing lines have been constructed, and the effect has always been disastrous to the public.

Finally, Mr. Chairman, no local exigency has been shown, no through exigency exists, the tunnel is of doubtful feasibility, and should the prayer of these memorialists prevail, I would advise that a marble slab be placed over each opening of the tunnel, and on it that there should be inscribed these words, 'A monument to the folly of Massachusetts.' I offer these remarks, not as a careful analysis of the evidence, but because I believe they cover the great point on which the memorial of the Troy and Greenfield Road hinges.

As soon as Mr. Phelps had concluded, at 6½, P. M., E. H. Derby, Esq., replied as follows, for the petitioners :

REPLY OF E. H. DERBY.

Mr. Chairman and Gentlemen : — " After two arguments in this case, I do not rise for a long speech, but to reply as briefly as I may to the Counsel of the Western Railroad, and to notice the new facts he has introduced — for many of which we are deeply indebted, and I am happy to address you, Mr. Chairman — as you have not visited the mountain or heard the evidence of my clients. Mr. Phelps professes to have done nothing out of this hall to influence the Committee. Such has ever been my policy, and if I have ever exercised an influence with committees, it may be ascribed to that policy: and we cheerfully concede that during this session, the course of the opposing counsel has furnished us no ground for complaint. We do not ascribe to him, individually, the action of the President of the Senate, and we have tendered to him and to his engineer, a free pass to visit the Hoosac, and they have availed themselves of that courtesy. We did not regard them as interlopers there, or complain of their presence, and if any one has telegraphed a different story, permit me to suggest it may have come from a person, who some years since received one of those missives, with a remonstrance against the aid of the State, and a five dollar bill to speed its circulation — about which this counsel knows more than his President. You listened last eve to the very faint denial of the President ; but if that counsel had been on the stand, he could have indicated the source of those remonstrances with which the State was flooded. He might have told you who furnished the funds, and who created the adverse influences which defeated my clients.

That counsel exults in his innocence to-day ; but was he harmless then ? His sleep, as he tells us, is disturbed — the tunnel of the Hoosac follows him in his dreams — it rests like an incubus on his conscience. His course will be, we trust, less exceptionable in future.

In place of science and facts, our opponent has favored you with some of his visions. I have suggested that his clients, the Western Railroad, have been for some years asleep, like Rip Van Winkle, on the hills of Berkshire, while the rest of the world was awake and progressive ; it seems the counsel has slept also, and when at a loss for argument gives you his dreams. I shall not reply to his distempered fancies, but confine myself to the few facts and easily refuted arguments he has adduced.

At first he urges our charter was granted upon a minority report, and therefore is entitled to little consideration. Is there force in this argument ? If the minority gave the better reasons, and the State granted our charter by a vote of *six* to *one*

against the opposition of the Western Railroad, is that charter not entitled to your respect? This is a new view of corporate rights. Our charter settled the exigency, both for a railroad and for a tunnel across Northern Berkshire, and when our State has in her eastern counties chartered railroads but four miles apart, are we to wonder she has not dedicated her whole western district, nearly fifty miles wide, as a close monopoly to the Western Railroad; or is it astonishing she overlooked the pretensions of that modest company and chartered one other line within the average distance of twenty-seven miles? Or has Massachusetts sunk to such a state of vassalage, that this is in truth a remarkable instance of courage to be recorded in her history?

But the gentleman urges that after we obtained our charter in 1848, we neither subscribed our stock or built our railroad, and asserts that while millions have flowed into other investments, the capitalist has frowned upon our enterprise.

How was it with his clients, and does this reproach come with a good grace from their lips? We have forty miles of railroad and tunnel to construct by our charter. We have raised from assessments eighty-three thousand dollars and expended one hundred thousand. What did the Western Railroad Corporation accomplish? They languished for years until they received the State loans and subscriptions, and in 1840, five years afterwards, when by that generous aid they had opened their line fifty-five miles from Worcester to Springfield, the private stockholders had been assessed but twenty per cent., and had paid but three hundred and eighty-six thousand dollars towards a line four times as long as the Troy and Greenfield. We have, unaided, done more in proportion than they did with the State subscription.

I thank the counsel, however, for one concession. He was born in the Deerfield Valley, and knows its inhabitants. He concedes their energy, their spirit and their patriotism; he gives them the character they deserve when he concedes they are the very men to carry through this enterprise. We come for a loan; the lender requires a good character, and the resistless force of truth has impelled our very opponent to indorse our character.

This gentleman urges, however, that millions of capital have flowed since 1848 into other channels. Why not into ours? What capital has gone since 1848 into new lines? Railroads were commenced in the palmy period of 1845, 1846 and 1847, and in the four subsequent years sacrifices have been made for their completion, and fearful sacrifices too, but what new enterprises have we begun within this period, and where and when does the gentleman discover a low rate of interest? Where does he discover a plethora of capital in New England? It has been absorbed as fast as created.

He then asks why have we not made demonstrations. His clients did not lift a finger until they received the State aid. Have we imitated their example? Have we not graded seven miles of our track? When our charter was granted, the Vermont and Massachusetts line was unfinished; nearly one hundred miles of railroad were wanting to unite Troy and Boston; but the Vermont and Massachusetts have breasted the storm—have finished their line, and sent their extension across the Connecticut to Greenfield. Our allies, the Troy and Boston Company, are pushing eastward, and have finished twenty-seven miles of admirable railroad, which they traverse in forty minutes. An easy valley invites them onward to our graded line in Williamstown; our tunnel and its rock moved into embankment will complete six miles more; and the entire residue, but twenty-seven miles, from Greenfield to the tunnel embankment, a line about as long as the Troy and Boston line east of Hoosac Bridge, awaits your fiat for its construction. We have shown more courage, more energy than our opponents.

But he says we might have sold our bonds at a discount if our enterprise was deserving; other companies have done so, and we might have followed their example. Is this the policy of Massachusetts? Shall we sacrifice the trade, the commerce of the State, her agriculture and her people, to the speculator and the

usurer? If such be the lessons of the Western Railroad, we shall resort to other schools of political economy.

But why has not the machine bored the mountain? It was not set up until last September, and the funds of the company and of its owners are alike exhausted. Its power had been demonstrated, and the session of the Legislature was at hand, and we have come here to invoke your aid. The machine has made its argument; I will not weaken it by mine. It has demonstrated its power by its actual performance in your presence; and action is more eloquent, more impressive than speech.

But let me follow the opposing counsel. He would revive the question of exigency which was deliberately settled by the charter. He can see no exigency whatever for our enterprise, although he concedes a railroad to Shelburne Falls will accommodate *all Western Franklin;* and is not *all* Western Franklin to be accommodated? He makes light of Shelburne Falls, although we have shown in that village a growth of fourteen hundred in three years, and a water power capable of employing seven thousand operatives; a water power nearly equal to that of Lowell, created at an expense of but one thousand dollars for the dam and canal. He makes light of Buckland, although it borders on Shelburne and participates in its prosperity. He forgets Coleraine, with its cotton factories and other manufactures, and nine thousand tons of freight, and sets down Charlemont and the rest of Franklin, as an agricultural community, regardless of their workshops, factories, tanneries, lumber and mineral resources.

The Western Railroad Company have given the cost of their fuel at two dollars and ninety-five cents per cord. It comes from the Berkshire hills. It is worth four or five dollars at Troy, and with us it commands but one dollar and fifty cents per cord, and millions of cords are perishing in the upper valley of the Deerfield. We can supply Troy and Albany on the one side and the Western Railroad on the other. The enhanced value of the forests alone will pay twice the tunnel loan.

We have shown by our tables that the population on the tunnel route is even now eleven hundred and fifty-eight per mile of railroad or twenty-five per cent. more than the population on the best section of the Western Railroad between Worcester and Springfield when that line was constructed; that such line was built for the through trade, but has signally failed to secure it, and has lived on the local traffic. The local business concentrated principally there has paid its interest, its dividends, and its per centage, to the sinking fund. We have one town on our line, the town of Adams, with twenty or thirty factories and six thousand seven hundred people, and nearly twenty thousand tons of freight, a town actually larger than either Springfield or Worcester when the Western Railroad was chartered, and we then have shown besides that our route was superior to the Western route in soil, lumber, mineral resources, and water power. But Mr. Phelps insists that Adams is already accommodated by a line to the Western Railroad in Pittsfield. But does that line give an adequate accommodation? The business of Adams was with Troy on the Hudson by turnpike, the distance less than forty-eight miles; and when the Adams man has reached Pittsfield he finds himself ten miles further from Troy than he was when he left home. He must travel over, and pays for passing over seventy-eight miles of railroad to achieve a journey of less than forty-eight miles. This route is as convenient as the route from Boston to Worcester by way of Providence, Rhode Island.

This line too was made not to benefit Adams, but to retard the true line. Adams required a line, and was required to give thirty thousand dollars even for this, in the shape of a guaranty fund. The Western road have credited nothing for the profit this branch has given to the main line, but showing *per se* that it made no profit, and what branch does? — have taken all the incidental profit, and required North Adams to make good the difference, and now when North Adams and

Northern Berkshire can reduce the journey to Troy from seventy-eight to forty-eight miles, and save in their journey to Boston and North-Eastern Massachusetts from thirty to eighty miles' distance, avoiding numerous grades, curvatures, time and expense, the Western Railroad Company inform them they are already accommodated. And this they venture to say in your presence. Permit me, Sir, to say in reply, that all Northern Massachusetts, from the mouth of the Merrimac and extreme point of Cape Ann to the hoary Graylock which guards the western portals of the State, demands the accommodation of the tunnel.

After dealing with the local exigency, Mr. Phelps contends that the through traffic, if not accommodated by the Western, is now taken, either by the water route from Albany around the Cape, or is taken by the Ogdensburg, and cites from the debates of a Convention of Directors, in which number I have the honor to be included, to show that the Western rates were too low and ought to be advanced. The Western Railroad, as Mr. Degrand well observes, was not built to carry the pitiful number of 34,000 through passengers, or 59,000 tons of through freight; the business of last year was *not one tithe of the annual increase of the business concentrating on the Hudson.* Nor was it built to compete with the circuitous navigation around the Cape, embarrassed with sea damage, insurance, wharfage and loss of interest. You heard from one of our first commission merchants, Mr. Farwell, who sells one hundred thousand barrels of flour yearly, the charge by water on flour, either direct or by New York, was at least twenty-five cents per barrel with other charges, which carried the price above thirty. He gave you the great fact on which our case hinges, that Boston could not compete with New York for the export trade in bread stuffs as long as New York had the advantage of twenty cents per barrel. The Western Railroad permits her to enjoy an advantage it was built to vanquish. We have demonstrated by actual results upon railroads of better grades, curves and business, that we, with our reduced summit and direct line, can transport flour from Troy to Boston at a cost to the railroad of but ten cents per barrel, or but two cents more than the charge from Troy to New York—all above will be profit, and when the line to Sackets Harbor is completed (and the tunnel loan will insure its completion) we have proved the distance from Lake Ontario to Boston will be less than to New York, and the charges for freight be reduced to the same level.—We ask you, Sir, if Boston, in the very centre of manufactures, most accessible to the Provinces, to the Fisheries, both cod and mackerel and whale, and two hundred miles nearer than New York to England, cannot then command a fair proportion of the exports of the country? If the Western Railroad, burthened with a ferry equivalent to many miles of railroad, with a summit towering 1440 feet above the sea, grades of 76 feet on one slope and 83 on the other, succumbs to the water competition, it does not follow that we, avoiding all those difficulties, reducing distance and curvature, and doubling the length and lading of our trains, must imitate her surrender.

As respects the Ogdensburg, it lengthens the line to Buffalo 200 miles if you start from Boston. It has its peculiar province, it will secure the trade of the St. Lawrence and the Ottawa, and control the eastern end of Ontario; it will give, as it has done, a vast local accommodation, but it is not to be named in comparison with ours.

Again, the gentleman says the Northern men proposed an advance of prices, and thought the rates of the Western on flour too low for imitation, and Messrs. Whittemore and Fairbanks favored an advance, and Mr. Derby joined in the discussion.

It is not usual to cite debates, but results. Does the gentleman find any resolve that freight cannot be carried at the rate then established, of 50 cents per barrel, for 410 miles over grades of 50 to 60 feet per mile, from Ogdensburg to Boston? It was thus carried at the rate, allowing for grades, of 18 cents per

barrel from Troy to Boston, and has not the Ogdensburg shown by its returns, that, almost destitute of passengers, it has earned large profits from this low rate, and been overwhelmed with business? But some gentlemen, Messrs. Fairbanks and Whittemore, asked an advance, and why? Their lines — the Passumpsic and Vermont and Massachusetts — did not participate to any extent in the Ogdensburg business, and had cost too much for the local — struggling with difficulties, oppressed by the sacrifices we seek to void, precluded from reaching Troy — forsaken by the State — the Vermont and Massachusetts sought to add to its local charges, and undervalued a traffic of which it scarcely partook — all suffered from the Rutland and Vermont Central quarrel, and all sought to allay the strife; and if my remarks are cited, you will find me there as you find me here, and as the Western road ever found me, the consistent advocate of charges low enough to command the business of the West until precluded by cost of transportation.

The gentleman opposed to us, overwhelmed by the mass of evidence as to summit, curves and grades, very wisely abandons that portion of his case, and concedes to us all we claim in the field of science. He does not care, he says, for curves or grades. He obliterates science, although his engineers, including Capt. Swift and his associates, McNeill, Whistler and Childs, names not unknown to fame, whose talents, too, were well appreciated and liberally compensated, deemed science of *some* importance when they built the Western road. I have referred you to their estimate of tunnelling in gneiss or mica slate, and the only difference between their tunnel and ours is in length of haul and depth of shaft, involving a few thousand dollars' increased expenditure, for they did not then think arching or lining were necessary in the mica slate of Berkshire, nor do they give that evidence to-day. But besides this evidence in our favor, I have cited from their report of 1838 other valuable data. To reduce the grade some three feet, to save a few degrees of curvature and enlarge the radius of a single curve, they recommend extra outlays at two points on the Western road, of $175,000. But we who obliterate from *twenty to seventy* miles of distance, remove *six hundred and forty* feet elevation, annihilate seven entire circles of curvature, diminish grades from *eighty-three to thirty-nine* feet, and supersede a ferry which costs *twenty-five thousand dollars* yearly, according to the evidence, — we, because we are not the Western Railroad Corporation, present no considerable advantages.

Why, Mr. Chairman, I will demonstrate on the evidence that this ferry *alone* with respect to freight, is equivalent to *one hundred* miles of railroad. We have cited the report of Mr. McAlpine, the State Engineer of New York, on Railroads, for the present year — State Document, No. 10, now before us — and have shown by the 12th page of that report, that the average cost of moving passengers on the lines of New York is already reduced to 50 cents per passenger, and 75 cents per ton per 100 miles; and by table S, annexed thereto, have shown that on some lines the rate falls to little more than one half those prices. Capt. Swift, the President of the Western Railroad, cites from table N, of this report, some different results, but even he concedes that New York lines are run at less cost as well as lower charges than those of Massachusetts, and cites from table N of the State Engineer, 63 cents per ton as the cost of carrying freight *one hundred* miles on the New York and Erie Railroad.

Now what is the proof as to the Ferry?

First — The unlading costs *twelve and one-half* cents per ton.

Second — The truckage from depot to depot in Albany, by a low contract, *twenty-five* cents more.

Third — The loading into the car at Albany for the West costs *twelve and one-half* cents more.

Fourth — The injury, delay, and cost of the ferry, maintained by the Western Railroad, amount to at least *twenty* cents more, making an aggregate of *seventy*

cents per ton, which would send the freight on the tunnel route from Troy to Worcester county, while the passenger loses half an hour in his journey. But the President of the Western Railroad tells us the ferry is to be obviated by a tunnel to dive under the noble Hudson, and gives some detail of the plan and estimates.

It is to cost but seven to eleven hundred thousand dollars, and the share of the Western Railroad is to be only $400,000. It is to commence half a mile east of the ferry, to descend by a grade of 80 feet per mile, to a point 80 feet below the track at Greenbush, to run under the centre of the river for 800 feet on a level, so that vessels and leviathan steamers may float over it, and then is to ascend with a grade of 80 feet per mile towards the Schenectady depot, where it connects with a line which climbs up from Albany with the very moderate grade of 90 or at least 80 feet per mile.

Capt. Swift thinks it will be made, although the Hudson River line have gone to windward of the Western by buying the Greenbush *Railroad* from Greenbush to Troy, with the *bridge* at Troy, and are now tunnelling Troy itself, to run their heavy freight trains by this bridge from New York to Buffalo. But how does Capt. Swift descend eighty feet in a half mile, at a grade of eighty feet to the mile, should it not be one hundred and sixty feet to the mile, and possibly two hundred, — for he tells us the Western Railroad starts on a jump to rise on its way East from Albany? And allow me to ask, What is to be done with the water while this tunnel is driven fourteen hundred feet under the oozy bed of the Hudson? Will there not be some percolation here, Mr. Chairman? We are told, Sir, that the water will occasion no difficulty; but did it cause none in the tunnel under the Thames, that gigantic folly of England, which has cost some four millions of dollars for no useful purpose? The Thames at London Bridge, is but half the width of the Hudson at Albany. But the water is to cause no inconvenience, Mr. Chairman. I am, I confess, somewhat amused with the intense solicitude of Capt. Swift, as to the water we may encounter in tunnelling the summit of the Green Mountains, and the composure and equanimity with which he regards the same element when he dives below a noble river, one of the great arteries of Commerce. When I see him glancing from his watery domain towards our mountain-tops, and suggesting the danger of water, I cannot but think of a dolphin disporting in mid-ocean, and glancing with an anxious eye for fear of a wetting at the rain-drops that sparkle in the sky.

This watery tunnel, to avoid a ferry alone, which we obviate and others avoid, may be scientific, but I venture to predict it will cost more than the Hoosac Tunnel itself. The data on which it rests are somewhat indefinite — at least, somewhat ambiguous. I fear they will not be entirely reliable, whatever annoyance the water may cause us on the top of the mountain. I fear it will prove as fatal to the Hudson Tunnel as the waves of the ocean proved fatal to the Minot's Ledge Light-house.

The President of the Western Railroad tells us its capacity is not exhausted — that it can transport a million and a half of tons; our difficulty is more with the cost than the capacity. If more cars are to be used, let us place them where they can be used to advantage. The evidence shows that on a portion of one line, with grades inferior to our grades between the Hudson and the Connecticut, we now send fifty loaded cars in a train, while the Western Railroad send but thirty over the best part of theirs, and but twenty-six from Albany to Pittsfield. We have shown, too, that sixteen per cent. less fuel is used per mile with the same train, between Springfield and Worcester, than between Pittsfield and Springfield, over higher grades. Let us, then, apply the cars and the fuel where they will render the most effective service. If the capacity of the Western Railroad is equal to a million and a half of tons, ours has double that capacity; it can carry three millions of tons if you will allow it the opportunity. But let me

advert to another branch of the case. The President of the Western Railroad, to show that we underrate the cost of our Tunnel, has selected five of the most gigantic works of Europe, the Box, Kilsby, Rochdale, Blechingly and Blaizè Tunnels, as standards of comparison; measuring these by the lineal yard, he would have you infer from their cost per yard, that ours, of a very different calibre, and through a very different material, would cost four millions of dollars; but to arrive at this conclusion, he adds, I think, one-third for our superior length.

I am accustomed to treat with respect whatever comes from this gentleman, when he has no personal interest, but it does seem to me there is a want of candor in this statement, in several particulars.

First. These European Tunnels he cites, with the exception of the Blaizè, as to which we have no particulars except its immense size, are among the earliest tunnels for railroads, and you have it in evidence from two of the ablest engineers in England, Stevenson and Vignolles, that there has been a reduction made in the cost of these early tunnels of at least sixty per cent. The calibre of the tunnels is diminished, and the shafts are reduced in size, in some cases ninety-six per cent., being from sixty to nine feet diameter, while the depths remain the same; the masonry and excavation are thus greatly reduced, and early errors avoided.

Second. The tunnels cited as a basis for comparison are of gigantic and unusual size. It has been ascertained that a tunnel of a smaller calibre, like ours, is ample. It has but 408 square feet of superficial surface, while the tunnels cited vary in diameter from thirty to forty feet, and in area from 900 to 1200 superficial feet. The excess in calibre is from 125 to 200 per cent., and the average excess in calibre over ours is at least 150 per cent. You might as well say that a barn to hold forty-two tons of hay must cost as much as one holding an hundred, because they were of the same length, but of different height and breadth; or that a light and long ropewalk should cost as much per lineal foot as a large stone warehouse.

Third. It would have been more candid for Captain Swift not merely to have given the area of these tunnels, but also to have stated the soil through which they passed, for they are laid in nearly every case through clay or quicksand. Now it is in proof that the most expensive tunnels of Europe are not through solid rock, for that forms itself a well supporting arch, but through the soft and wet clays of the moist climate of England, saturated with water, in which no good foundation can be had, through soft clay, which is constantly pressing upon the interior, crushing the timbers, letting in water, requiring a lining and arches of masonry. Our tunnel, on the contrary, is through a species of mica slate, which, by the evidence of General Bernard, Col. Baldwin, Messrs. Whistler, McNeill, Child, Edwards, and James Hayward, to say nothing of Mr. Marchant, of England, will require no masonry. And it is a little singular as respects Capt. Swift's evidence concerning the Box Tunnel, that Marchant, the Engineer and contractor, who built the Box, has been consulted as to ours, and estimates it to cost less than a million. The cases cited by Capt. Swift, including the Blaizè Tunnel, which he admits is as large as the Nerthe and double the calibre of ours, confirm rather than disprove our testimony, and prove that ours must cost less than two millions.

There is another point in the testimony of Capt. Swift to which I feel bound to advert—that the time occupied at the summit cut of the Western, was a criterion by which to estimate the time the tunnel would require. It was well met by Mr. Degrand, who showed the cut was opened on but one side, until a Director interposed and accelerated the opening of the line, which had been retarded, and would have been still more seriously delayed if common sense had not intervened. It is somewhat unsafe to rely upon such comparisons.

Capt. Swift then cites a high priced tunnel on the Chesapeake and Ohio Canal,

but it was slowly paid for in depreciated bonds by a broken down company. He then gives us General Bernard's estimates for a tunnel of four miles through the Alleghany for the same canal, to cost three millions two hundred thousand dollars. But why does he omit to say that the bore was forty-five per cent. larger than ours, a difference which would reduce the estimate nearly one-third? And why does he omit the still more essential fact, that more than two-thirds the estimated cost in the Alleghany Tunnel of General Bernard was in masonry, as I have shown you by his report, while the tunnel, apart from the masonry, he sets at less than a single million? This, when analyzed and probed, does not damage, but confirms the proof for the Hoosac Tunnel.

But I will not detain you longer with Captain Swift; his interests and his sympathies are against us, and have disturbed his vision. I pass to Captain Parrott, a gentleman who has been familiar with the sea as well as the land; and who has prattled a little about tunnels. He cites us two from the Reading Railroad — the Pulpit Rock and the Black Rock Tunnels. One of these we have proved already, and it shows that our Tunnel will cost less than nineteen hundred thousand dollars; and if we take them both, their average cost will make the Hoosac cost less than two millions, and this you will remember is the testimony of our opponents.

But I have omitted William Raymond Lee, who set our Tunnel at three millions. But Mr. Lee is candid; he admits that the data on which he founded his estimate were very limited; and he frankly concedes that he has had no experience whatever in tunnelling, but has devoted his life from boyhood for twenty years past, to running the Providence Railroad and to its branches. He bases his estimate on a canal tunnel in England, the Box and the Blechingly, the large tunnels through clay and quicksand to which I have alluded, and the Black Rock Tunnel, already cited as one of the most expensive here. He states, also, that he feared water, and made a liberal margin for contingencies. Had Mr. Lee sufficient data, I have no doubt he would give us a fair estimate. But what opportunity has he had? He has never seen the rock of the Hoosac, and allows for stone masonry to support the roof. You have seen it and know it is sufficient, and the very rock we excavate is suitable for arching. Then as to the water which is so harmless under the Hudson, we have proved by the report of Messrs. Hale and Treadwell, Water Commissioners, that a single pipe of twenty-one inches diameter will lead away upon the slope of our railroad of twenty-six feet to the mile, six millions gallons daily, and two pumps like those proposed by Hale and Treadwell for our water-works, would lift that quantity daily from a shaft; and what shaft is proved to have ever been invaded by such an influx? The water, gentlemen, which is yielding up the Harlem Lake to the steam-pump, will obey the laws of science in the mountain. The length of our Tunnel need give you no alarm. The tunnel of the Marseilles aqueduct is ten miles in length; the adits of the Cornwall mines thirty miles long; the Duke of Bridgewater's canal thirty miles under ground; the tunnel of Hungary some ten miles long, and water has not prevented the excavation of square miles of coal mines. We are above the level of the lakes and rivers.

I will glance for one moment at the evidence of Messrs. Gray and Green, agents of the Western Railroad. The first furnishes the most conclusive evidence of the value of low grades and straight lines to a railroad, for he gives you a vivid picture of a train running down the grade of sixty-six feet at Springfield, through the passenger-house and the engine-house almost into the river, killing five valuable men on its way. He gives you, also, the collision on a short curve at Westfield, when two trains of passengers met at full speed upon the track, dashing the cars into pieces, and killing and wounding the passengers at a cost of $30,000 to the company. Could we have a more valuable illustration of the importance to the public safety of reducing grades and curvature? As respects

distances, Mr. Gray has made a mistake of twenty miles in favor of the Western Railroad in the table he has submitted. For he has in several instances in his computation advanced the distance from Albany to Troy at least twenty miles. You will make the correction, and note also that we begin near the Troy Bridge, while Mr. Gray commences at the expensive ferry of Greenbush — for this, also, you will make due allowance, and measure the distance to Sackets Harbor by the new line from Saratoga.

But let me not forget Mr. Green, who tells us that one engine lifts the flour from fourteen boats at Albany, by separate falls twenty feet into the depot — an expense saved by our Hudson Bridge, for we may reach the flour twenty-five miles above Albany, at the Canal bank in Schenectady. He proves, also, the fact that the Hudson River Railroad Company are preparing to send large masses of freight through Troy to New York, in direct competition with the Hudson, thus confirming Johnson, who proves the large provision of cars they have made for this. If they can compete with the river, we must fully compete with the river railroad.

I have referred to the evidence called in reply to the Western Railroad. Mr. Hayward most effectually demolished the Rochdale, Box, Kilsby, and Blechingly Tunnels, as standards of comparisons, and I trust you will not forget that the modern Woodhead Tunnel has been built near the Rochdale at one-third of its cost per lineal yard, and is a mile longer than the Rochdale. Let me refer you, also, to the evidence of Mr. Clapp, who meets conclusively the testimony of Messrs. Swift and Lee, as to the increased cost of tunnels on the Baltimore and Ohio, for he proves by the statement of Mr. Latrobe, the Chief Engineer, under date of the thirteenth of February, since this case was opened, that the actual cost, not estimate of sixteen tunnels on the Baltimore and Ohio, has averaged but two dollars and sixty cents per cubic yard, at which rate our tunnel will cost less than a single million.

But, gentlemen, I will not detain you longer with the subject of curves, grades, ferries, and tunnels, either above or below the horizon. I have replied in full to the evidence of our opponents, and to the well-timed silence of their counsel on these important topics, and feel I have established the scientific portion of our case on the strongest testimony Europe or America can afford.

I come now to the losses the Western Railroad Corporation are to sustain, if our tunnel be constructed, and when you analyze them you will find them quite as imaginary as the dreams of their counsel.

Their evidence has supplied us with the data for computation. They claim that we cannot, if our tunnel be completed, divert their whole through traffic. While I am prepared to concede this point, (for they control the great and growing city of Albany, and the country below, to Hudson,) I assume, for the purposes of the argument, that we divert the whole, without diverting the local traffic, which is controlled effectually by the Western. Of what does this through business consist? It is composed of two items only, supplied by their reports to their stockholders proved in the case. Their report of January, 1853, proves the fact that they carried, during the preceding year, fifty-nine thousand tons of through freight, and thirty-five thousand through passengers, and their Memorial shows the cost of transportation to be one cent and one-half per passenger, and per ton a mile, or three dollars each per ton and per passenger. We have then but to ascertain the income derived from the through passengers and freight, and we arrive at reliable conclusions.

Their Superintendent, Mr. Gray, informs us that the Western Railroad does not average more than three dollars per ton from its through freight, to which must be added one-fourth for the proportion of the Boston and Worcester line, making an aggregate of three dollars and seventy-five cents per ton. Mr. Gray also informs us that the first class passengers are carried one-half at five dollars

and one-half at four dollars, in connection with the Buffalo line, making an average of four dollars and a half from Albany to Boston. The second class are carried at three dollars each, and in some cases at lower prices, but I assume the higher estimate, to do entire justice to the Western.

How then stands the computation?

59,000 tons of freight at $3\frac{3}{4}$, are	$221,250
30,000 first class passengers at $4\frac{1}{2}$, are	135,000
5,000 second class passengers at $3, are . . .	15,000
94,000 tons and passengers produce	$371,250
Cost of transportation of 94,000 at $3, is . . .	282,000
Balance, ...	$89,250
From this we must deduct for the proportion of Boston and Worcester Railroad Corporation, one fifth, . . .	$17,950
Balance, ...	$71,300

But the diversion of this business liberates at least one-fourth of the motive power — cars and engines, besides a depot at Albany, which may be applied to other purposes. It liberates a capital of at least $350,000, the interest of which must amount to at least $21,000, and reduce the net loss of the Western to fifty thousand dollars, or less than one per cent. on its capital, and as the local business of the line is annually increasing, and does increase on other lines, at the rate of ten per cent. per annum, the cars and stations may be used for a more lucrative traffic, and such loss replaced before the completion of the tunnel.

It would seem from the evidence of the Western Railroad itself, that nine-tenths of its vast net revenue, amounting to more than $700,000, has been thus derived from its local traffic, and may it not yield one tenth of that revenue for a great public object, when its replacement from other sources may be confidently predicted?

Have other lines injured the Western road? The evidence answers in the negative. In face of the Northern lines, it has held its own. Mr. Gray concedes the Hartford and Springfield, and the Providence and Worcester roads, have given it more than they have taken, and the New London line has done it no perceptible injury. Why, then, this nervous apprehension of loss from public aid to a public benefactor?

Why does not the Rutland object, or the Ogdensburg? They have quite as good a case as the Western, for they have done the State some service. Why do not the coasters appear, for they compete a little with the Western, but the coasters take a more enlarged and enlightened view than the Western. If we can make Boston the port for shipping flour and breadstuffs, and a depot for fish, oil and merchandise; if we can give an impulse to the port which shall call for three thousand new structures yearly, they see their prosperity in the growth of foreign and coastwise trade, and will, with intelligent liberality, advocate the loan.

Let me hasten to conclude. When we stood at the foot of the Hoosac, there was with us a farmer of Illinois, who said he wished to reach his old homestead by the direct and level route, and if the sons of the old Bay State had not spirit to dig through the mountain, he would send down his sons, the young Hoosiers of the West, to lend their aid and show us how to do it.

When Holland — little larger than Massachusetts — when her fair daughter New York — when Maryland and Pennsylvania, and youthful Ohio have done so much, let not the Hoosac stand a barrier to our trade, the derision of the West — but aid us to open through its heart, less stony than that of the Western Railroad, an artery of commerce.

Thirteen years since I took an active part in advancing the Western Railroad. I came to its aid, not at its inception, but at a period of trial, and aided it in surmounting its financial embarrassments, and in creeping over the hills of Berkshire. I gave to it the vigor of my manhood, and toiled four years in its direction — a period of gloom and uncertainty. While others received liberal salaries, I was content to fill a public trust with little compensation, beside the knowledge I acquired and the consciousness of doing my duty. I have argued long with Committees and Governors for the State aid. I had faith then, and have faith now, the Western would pay, and will continue to pay, a fair remuneration, and I do not regret the time I devoted, for it has benefitted the State. But while it has succeeded, as a commercial enterprise it has not accomplished the great object we pursued ; it has not controlled the commerce of the West.

The grades, the curvatures, and the summit forbid. I have since enlisted with the Charlestown Branch; have aided its expansion into the Fitchburg, and cheered onward the Vermont and Massachusetts. A small section only remains to reach Troy and Lake Ontario by the direct and level route ; and now with the same courage, the same faith with which I asked the aid of the State for the Western Railroad, I invite it for the Troy and Greenfield ; I risked my reputation on the success of the Western, and was sustained by the result. Time and experience have sobered my judgment, but have not quelled my courage; and now, gentlemen, I venture to make a new prediction — I predict with entire faith that this loan shall effect its object ; that the tunnel shall be achieved within the estimate ; that the tunnel shall secure the State ; that the enterprise shall pay remunerative dividends; shall command a liberal proportion of Western commerce, and confer benefits on the public far exceeding those derived from the Western Railroad.

The opposing counsel has spoken of a marble tablet, to be placed at the entrance. Should this loan be granted, and the tablet reared, I would ask no higher honor than to have my name inscribed among those who planned the enterprise and invoked the aid of the State, for I should rest assured of many a blessing.

Let us all have the privilege of aiding this great enterprise of the old Bay State.

Take courage, and give the aid of Massachusetts to this noble work. Let the tunnel be associated with the battle-grounds of the State — with Bunker Hill, Lexington, and Concord, which overlook the route. Like yonder pyramid, let it be a monument of the spirit of the old Bay State; and let it never be said that the spirit which bid defiance to an Empire, which whitened the thirteen States with the bones of Massachusetts, quailed before a slate-hill."

Postscript. — The New York Tribune, in commenting on the second speech of Mr. Derby, notices a tunnel made by Saxony, a State one fifth less in size than Massachusetts, although with half a million more people. This tunnel is twenty-four miles in length, and extends from Meissen on the Elbe to Freiburg.

A. G. Farwell, called.* — "Have been engaged in the flour business in Boston some eighteen years. Have sold on an average 100,000 barrels per year. We have had great difficulty in getting flour from the West, especially the past winter. We are now receiving flour that arrived at Ogdensburg in November last. Large losses have attended this delay, and suits have been instituted to recover them. The cost of transporting flour to New York is about 20 cents less than to Boston. New York has great advantage over Boston on this account. If we could get flour within 10 cents per barrel as cheap in Boston as in New York it would greatly benefit the city — it would increase exports to

* Accidentally omitted in its proper place — page 24.

Europe, Nova Scotia and New Brunswick. There have been a large number of vessels sent from this port to California and Australia, laden in part with flour. The shipments of flour to Liverpool are mainly from New York."

Cross-examined by Mr. PHELPS. — "We have received some flour by the Western Road; cost more than by Ogdensburg — pay 50 cents per barrel from Ogdensburg to Boston; Canal charge from Buffalo to Albany is 50 cents, from Albany by packet to Boston, 25 cents, and from Albany to Boston by Western Road is now $31\frac{1}{4}$ cents per barrel. Two or three years ago we received several consignments from Albany via New York because the Western Railroad charged high. This was very troublesome. A large portion of the trade of Maine goes to New York in consequence of flour being obtained so much cheaper there than here. The cost of bringing flour from New York to Boston varies from $12\frac{1}{2}$ to 20 cents per barrel — the average price is 15 cents."

Direct examination resumed. — "In bringing flour from New York there are also charges for insurance and interest 4 cents per barrel, and wharfage here 2 cents per barrel, and damage by the voyage, — in all over 6 cents.

The exportation of flour from Boston to Europe is small, to Australia and California it is considerable."

TABLE OF CONTENTS.

PAGE

Baldwin's, Loammi, estimate of cost of Hoosac Tunnel 26
Ball's, Judge, Table of products of Hoosick for 1850 10
Batchelder, J. C., testimony of 29
Carpenter, J. A., testimony of 28
Clapp, Otis, testimony of 19, 61
Commerce of Western Lakes, statistics of 32
Committee, names of 2
Derby's, E. H., opening argument 6
" " closing argument . . . . . 43 to 56
" " reply to Phelps 67
Degrand, P. P. F., testimony of 61
Edwards, A. F., testimony of 12
" " Table of Curvatures 30
" " " Grade 30, 31
" " " Distance . . . . . 29 to 31
Farwell, A. G., testimony of 77
Goulding, Henry, testimony of 28
Gray, Henry, testimony of 69
Green, Thos. L., testimony of 60
Hayward, James, testimony of 24, 61
Hoosac, visit to . . . . . 8 to 11
Johnson, S. F., testimony of 32
Keith, J. M., argument of . . . . . 32 to 43
Knight, H. G., testimony of 27
Leavitt, R. H., testimony of 12
Lee, W. R., testimony of 59
Lincoln, Hawkes, testimony of 62
Marchant's, Mr., estimate of cost of constructing Hoosac Tunnel . . 25
Parrott, W. P., testimony of 59
Phelps, Ansel, opening argument of 56
" " closing argument of 62
Porter, John, testimony of, and Table of Population . . . . 11 & 12
Swift, W. H., testimony of 56
" " statement as to cost of Tunnel in mica slate . . . 13
Stevenson, Robert, statement as to cost of Tunnels 13
Table of Passengers on New York railways, 1851–1852 33
" of Passengers on Western Railroad 33
" of Tonnage arriving at Hudson River, 1851–1852 32
" showing power of Engine on different grades 31
Tunnels, Box, character and dimensions of . . . . . 17 to 25
" Blaizè and Blechingly 57
" Black Rock 59
" Cincinnati 21
" Hoosac . . . . . 15 to 17
" Kilsby 56
" Nerthe 27
" Nochistongo 14
" Pulpit Rock 26
" Rochdale 62
" Saltwood 57
" Thames and Medway 25
" Table of, on Baltimore and Ohio Railroad 20
" Table of 14
Vignoles's statement as to cost of Tunnels 13
Williams, Mr., testimony of 60

THE

HOOSAC TUNNEL

AND

Troy and Greenfield Rail Road.

1862.

THE

HOOSAC TUNNEL

AND

Troy and Greenfield Rail Road.

1862.

Commonwealth of Massachusetts.

STATE HOUSE, SENATE CHAMBER,
Boston, February 17th, 1862.

DEAR SIR: The undersigned is instructed by the Committee on so much of the Governor's Address as relates to the Troy and Greenfield Rail Road, to obtain the information sought in the House Order of February 1st, concerning that matter; and he will be obliged if you will, at your earliest convenience, furnish answers to the inquiries contained in the enclosed paper.

Yours, Respectfully,

JOHN J. BABSON.

D. L. HARRIS, Esq.

WHETHER the actual cost of the portions of the Tunnel already done has been greater or less than the original estimates, and how much greater or less?

What it will cost to finish the work, and the time it will require to do it?

Also, how much it will cost to complete, and put in running order the other portions of the Troy and Greenfield Rail Road?

31234

HOOSAC TUNNEL

AND

TROY AND GREENFIELD RAIL ROAD.

SPRINGFIELD, March 8, 1862.

Hon. JOHN J. BABSON, of the Committee on Troy and Greenfield Railroad, Massachusetts Legislature.

SIR:—Your communication covering certain inquiries relative to the Hoosac Tunnel and the Troy and Greenfield Railroad, was duly received. In complying with its requests, I will take up the questions in the order they are presented.

1*st. Whether the actual cost of the portions of the Tunnel already done has been greater or less than the original estimates, and how much greater or less.*

The original estimates for the Hoosac Tunnel, made by the engineer of the Troy and Greenfield Railroad Company, and reported to the Legislature in 1848, (Senate Document No. 120,) and subsequently in 1853, (House Document No. 125,) were as follows:—

ESTIMATE.

"The length of Tunnel, from heading to heading, is 24,100 lineal feet. In volume, equal to 15 cubic yards per lineal foot. Total amount of excavation, 361,500 cubic yards. Cost of Tunnel per lineal foot, $69.52, viz.:—

A,	36 feet,	at 50 cents per foot,		$13 50	a yard,		$18 00
BB,	100 "	30 "	"	8 10	"		30 00
C,	269 "	8 "	"	2 16	"		21 52
	405 cubic feet, equal to 15 cubic yards,						$69 52
Cost per cubic yard,							$4 63½

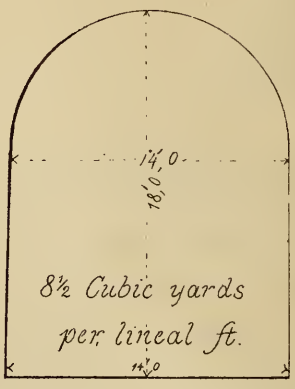
The whole amount for excavating Tunnel,	$1,675,432 00
Masonry, 6,025 perches, at $5,	30,125 00
Air pipes, 1,085 tuns, at $50,	54,000 00
Superstructure, including iron, &c.,	64,000 00
Engineering and contingencies,	125,000 00
	$1,948,557 00"

This estimate, which, exclusive of superstructure, amounts to about $78 per lineal foot, contemplated the construction of a tunnel for two tracks; the same to be arched wherever necessary, and completed in all respects ready for use. The proposed dimensions, as elsewhere stated by the engineer, were to be 22 feet wide at bottom, 24 feet wide at the spring of a semi-circular arch forming the crown or roof, and 20½ feet high. So far as can now be judged, the prices for the work were liberal, on the assumption that no unforeseen difficulties would be encountered. Very small allowance appears to have been made for contingencies, though the engineer states that these are intended to be covered in the "prices per yard, which are very much increased from what they truly ought to be," in order "to cover every expenditure and contingency."

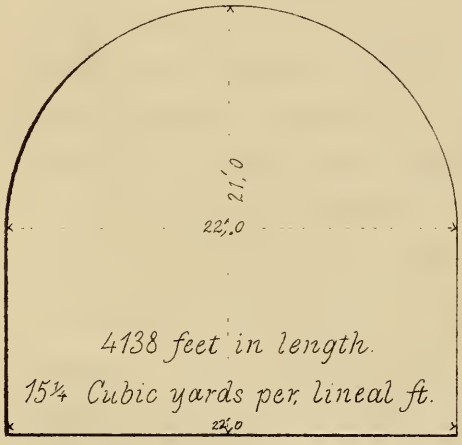
The question whether the actual cost of the portions of tunnel already done, has been greater or less than the above estimate, is embarrassed by the circumstance that no part of the work has been done according to the plan therein contemplated. The original loan act of 1854 provided that the tunnel might be built "of size sufficient for one or more railroad tracks," and in July, 1856, the railroad company made a contract, which, while it provided that "the great tunnel and its approaches shall be estimated at two millions of dollars for a double track," at the same time stipulated that "the contractors might build the tunnel for a single track; in which case, no abatement in price shall be made for the first three thousand feet, but afterwards the sum of twelve dollars per lineal foot shall be deducted for the remainder." It was also stipulated that "the hight of the tunnel shall not be less in centre than 18 feet above rails," and "not less than 14 feet wide." It appears, however, from the statement of the engineer sent by the Governor and Council to examine the work, that when, in October 1859, the first advance of scrip was made on account

Cross Sections of Tunnels.

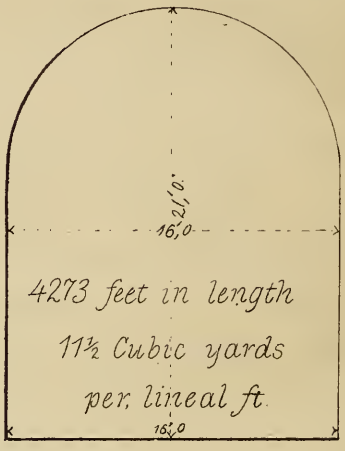
Hoosac Tunnel as projected and estimated upon when loan was originally granted.



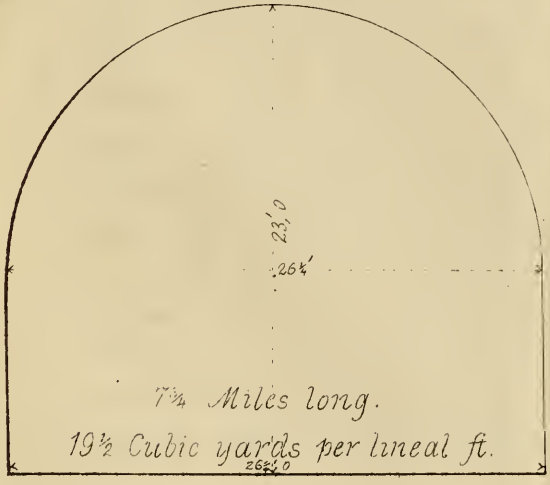
Hoosac Tunnel as thus far completed.



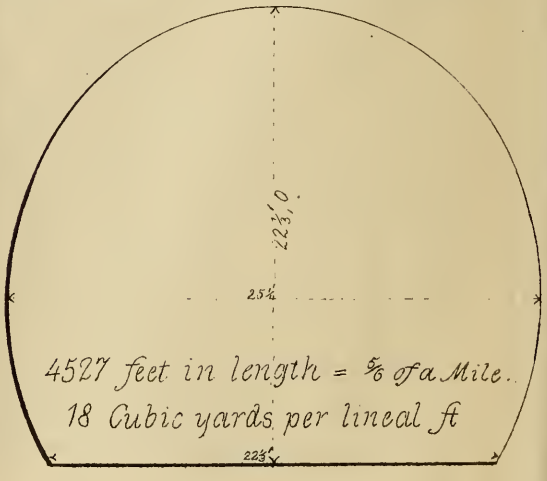
Kingwood Tunnel, Baltimore & Ohio R.R.



Blue Ridge Tunnel in Va. constructed for single Track and completed in 1857.



Mont Cenis Tunnel Under the Alps.



Tunnel at St. Martin's on Bourbounais R.R. France.

Milton H. Bradley Springfield Mass.

of the tunnel, the average size of the gallery at the east end, was only 13½ feet wide by 14½ feet above the rail.

In the modification of the loan act, made in 1859, it was formally provided by the Legislature, that the tunnel might be excavated 14 feet wide, with a total hight of 18 feet. A tunnel of this latter size contains 8½ cubic yards in each lineal foot, against 15 yards per lineal foot in the structure upon which the original estimates were based. In order to arrive at a better understanding of these dimensions, and to aid your Committee in judging of their sufficiency, I present cross-sections of the original and present plan of the Hoosac Tunnel, with sections of sundry other important tunnels recently completed or now in process of construction. (*See Plate.*)

With a liberal allowance for contingencies, the cost of excavating the gallery 2,300 feet long, 14 feet wide by 18 feet high, on the east side of the Hoosac Mountain, has probably fallen short of $35 per lineal foot; it certainly has not exceeded $40 per lineal foot—*say* $37½ *dollars*, being less than one-half the original estimate for a double track tunnel. On the west side of the mountain, for half a mile from its base, the line of the tunnel is through a secondary formation differing entirely from the material of the mountain proper. Of this distance the first five or six hundred feet, now excavated, is through loose limestone, abounding in water, and exceedingly difficult to remove. This part of the work should have been built as an open cutting, the depth of rock and earth over the top of the gallery being too small to have warranted that kind of structure. If completed as a tunnel it will require substantial arching and side-walls, which have not been provided; the superincumbent materials being now supported on posts, timbers and planking, which are fast going to decay. The cost thus far has probably amounted to $100 per lineal foot for the excavation and propping up. The necessary arching may be estimated at $40 a lineal foot additional. So far, therefore, as a comparison can be made between "the actual cost of the portions of the tunnel already done," and the "original estimates," the accounts will stand as follows, viz:

ORIGINAL ESTIMATE.

2,300 feet of gallery excavated at east end.
550 feet of " " west end.

Total, 2,850 feet, at the average of original estimate for double track tunnel, $78, would amount to $222,300 00

COST OF WORK DONE.

Excavating 2,300 lineal feet at the east end for a single track, 14 feet by 18 feet, at $37½ per foot,	$86,250 00	
Excavating and propping up 550 feet of gallery at the west end, at $100 per foot,	55,000 00	
Probable expense of arching same, 550 feet at $40 a foot,	22,000 00	163,250 00
Difference,		$59,050 00

2d. What will it cost to finish the tunnel, and what time will be required to do it?

This question will be considered in two parts—as to *cost* and *time*. *First*, as to cost. It should be observed that everything depends on the internal structure of the mountain. The material at the inner end of the eastern gallery, and the shaft near the western base of the mountain, is of the same character. It consists of a soft micaceous or talcose slate, imperfectly stratified, and containing numerous lumps and nodules of quartz rock (flint). The layers stand on edge, and are said to be slightly inclined toward the mountain; that is, on the east side the inclination is to the west, and on the west side toward the east. If it could be known that the material is of this same character, and that the relative position of the strata remains unchanged throughout the intervening three and a half miles from the eastern gallery to the shaft on the west side, the estimates of the cost would be easily arrived at. But all experience leads us to anticipate serious changes in such a distance. The mica slate, interspersed with quartz and nodules, may give place to beds of pure quartz, feldspar, serpentine, or some other description of rock found in this range of mountains. President Hitchcock, in his report of the geological survey of the state, tells us that the Hoosac Mountain region has been the theater of grand disturbing causes in the earth's history. I present a few extracts shadowing forth his opinions:—

"Berkshire County contains the principal repository of quartz rock. It is there interstratified with gneiss and mica slate, especially along the valleys of that county. * * * In Savoy it occurs near the top of Hoosac mountain.

"There are some facts that lead us to believe that there exists, in the western part of Massachusetts, extensive fractures or faults coincident in direction with the ranges of mountains. One of these is the existence of thermal springs at Williamstown, New Lebanon and Mount Washington. For, in most every other part of the world, such springs indicate fissures in the rock, reaching to a great depth. Another fact is dolomitization, which has taken place in this County, and which I shall soon describe more particularly.

"Such are some of the marks of the powerful action of internal heat upon the rocks of Berkshire County. To the geologist and chemist they are as striking and convincing almost, as the lava and smoke of Vesuvius are to the common observer."

These views of Professor Hitchcock certainly indicate the probability of changes being met with in the formation of the Hoosac mountain; but, should the rock continue to be mica slate, it may assume a less compact and adhesive character, or the position of the strata may be changed from vertical to horizontal. In either event the expense of a tunnel would be enhanced, and, should the structure of the rock be so far varied as to admit the percolation of water in large quantities, the cost would become *altogether problematical.*

If, however, we may be allowed to assume, for a basis of calculation, a simple gallery 14 feet wide by 18 feet high, under the mountain proper, three and one-half miles, and also assume that the material found at the east side, and at the shaft near the western base of the mountain, will remain unchanged in character and relative position throughout, it is safe to estimate the cost at $60 per lineal foot. Under the same conditions, the cost of a tunnel 23 feet wide by 20½ feet high for two tracks, as originally designed, would probably fall within $75 per lineal foot; but the difference between $60 and $75 per lineal foot must not be taken as an estimate of enlarging a tunnel of the smaller size after it has been brought into use. The cost of the latter operation would, in all probability, be not less than three times this difference. The above remarks apply to that part of the tunnel under the mountain. I come now to the half-mile beyond its western base.

As before stated, the gallery at the west end, some 550 feet long, was excavated through a body of loose limestone; beyond this point, the material changes to *earth* and *quicksand*, abounding in water, and in which very little progress has been made. The present indications are that this formation will continue, with little interruption, to the base of the mountain—say, 2,750 feet, or about half a mile. There can be no doubt that a tunnel through these materials will require heavy side walls, with substantial arching overhead and, through much of the distance, an inverted arch at the bottom.

The cost of this part of the work cannot be foretold with any tolerable approximation to accuracy; $250 and $400 per lineal foot may be named as the limits within which the actual cost would be likely to fall. For the purpose of arriving at an estimate, let us assume it to be $300 per lineal foot, for a single track tunnel, 14 x 18 feet. The cost of a tunnel for two tracks would be from 25 to 40 per cent. greater—-say $400 per lineal foot. But if the smaller tunnel were to be first completed, and subsequently enlarged for two tracks after being brought into use, the cost of the second operation would be likely to equal the first. Even if the gallery should be first excavated for a single track, and temporarily sustained with timber, and afterwards, before the tunnel was brought into use, it should be determined to enlarge and arch it for two tracks, the total cost, resulting from such management, would be from 50 to 75 per cent. greater than the cost of accomplishing the same result at one operation.

In corroboration of these statements, I will refer to the tunnels on the Baltimore and Ohio Railroad. They were constructed mostly through mica slate rock, and were generally 16 or 17 feet wide, to accommodate a single track. After the road was opened through, say from 1854 to 1860, the expense of timbering, widening and arching fourteen tunnels, measuring in the aggregate 11,300 lineal feet, was $995,640, being an average of $88 per lineal foot.

The case of the Lindell tunnel in England is also in point. This tunnel was completed and put in operation in 1851, for a single track; three years later it was decided to enlarge it for a double line. The operation was accomplished for about $63

per lineal foot—more than double the cost of the original construction. "Before the works of enlargement were commenced, the contractor suggested that another single, or twin, tunnel, parallel with the existing one, could be constructed with less risk, and he offered to complete it for the same sum, notwithstanding the additional excavation necessary for the approaches. The proposition had not been favorably received, because there was no precedent for such a work, and because it was known that there were many and *grave disadvantages* in working a single line tunnel."

There is one other element of cost which must not be overlooked in a work of this magnitude and duration. I refer to interest on the amount expended as the work progresses. The average annual outlay for completing the Hoosac Tunnel, of the dimensions heretofore adopted, would probably be $108,000; the amount of interest on this sum, at five per cent., is $5,400; the interest account would, of course, be increased from year to year by this sum, (in addition to interest upon interest,) and, before the completion of the tunnel it would become nearly $145,000 per year. I find the total amount of interest on future expenditures, computed on this basis, to be about $1,100,000.

Bringing together the foregoing results, I present them as my estimate of "the cost to complete" a tunnel of the present limited size, on the supposition that the structure of the mountain proper will correspond throughout with its present character at either side, and no water be found.

ESTIMATE.

18,500 lineal feet, say three and one-half miles, of unarched Tunnel, for single track, under the Mountain, at $60 per foot,	$1,110,000 00
2,750 lineal feet, about half a mile, of arched Tunnel, for single track, on the west side, at $300,	825,000 00
Interest, at five per cent., on expenditures until completion,	1,100,000 00
Total,	$3,035,000 00

Should it be determined to enlarge the dimensions and construct a tunnel in the first instance for two tracks, an additional sum, equal to thirty per cent., say $910,500, will be required.

My estimate has been made up on the basis of a tunnel 14 feet wide by 18 feet high, because the construction thus far

purports to be of that size, and that size was authorized by a former legislature. If there is to be any new legislation on the general subject, I suggest the propriety of inquiring whether there cannot be some improvement in this particular. That a tunnel four and one-half miles long, 14 x 18 feet in size, and rising to a summit in the middle, will answer for the passage of trains carrying passengers, is scarcely possible. Without the most thorough ventilation, the smoke and gases proceeding from the locomotives, combined with the exhalations from natural sources, will so vitiate the atmospheric air as to render it wholly unfit for respiration. That such ventilation, under circumstances as supposed, can be attained within the limits of any moderate expenditure, if at all, is exceedingly doubtful. The air in such places becomes dense and sluggish. While constructing the Blue Ridge tunnel, as I learn on the authority of the engineer, owing to the density of the air, smoke occasioned by blasting often times did not clear away sufficiently, between Saturday at midnight and Sunday evening, to admit the use of instruments by the engineers in testing the accuracy of the line. Although abundance of fresh air was driven in through tubes and discharged at the headings, it was found in practice to be so much lighter than the air, which was charged with noxious vapors, as to rise above it and escape along the roof of the tunnel.

A large and costly shaft over the apex of the grades, near the middle of the mountain, would certainly be indispensable, if the tunnel were of the size originally contemplated. Indeed, it is more than doubtful whether the tendency of the air to rise in such a shaft would be sufficient to set in motion the heavy vapors filling the tunnel, without the aid of a large fire in the shaft, or powerful fans to drive them along, retarded as they would be by friction against its outline. *I consider it certain*, that, even with a central shaft and powerful machinery to urge the dead air and gases along, it would be impossible to keep the atmosphere of the tunnel, if only 14 feet wide by 18 feet high, pure enough to make breathing tolerable.

The case is somewhat different at Mont Cenis, where shafts are impracticable. The area of that tunnel, as I have shown on a former page, is more than twice as great as the present

area of ours, its grades are differently arranged, and it is reasonably hoped that the powerful machines now employed to discharge compressed air at the headings, for driving the drills and for ventilating the tunnel while being constructed, will suffice to propel a moderate current through its whole length.

Second. As to the time in which the tunnel can be completed.

The progress in future must be calculated from what has already been accomplished on this work, and from what is known of the rate of advance in other tunnels. From a careful examination of the reports of the engineers employed by the State, I find that the progress at the east end of the Hoosac tunnel, between September 1st, 1858, about which time the first advances of State scrip were made, and October 1, 1859—a period of thirteen months—was, on the average, 39 lineal feet per month; from that time until April 1, 1860, the progress was 35 feet per month; and from the latter date till the suspension of operations, about July 1, 1861, the average monthly progress was 56 feet. As the work is known to have been continuously prosecuted during the latter period, under the administration of the present loan act, which authorizes the advance of $50 in State scrip for each lineal foot of tunnel—a sum exceeding by at least 25 per cent. the actual cost at present—it may be fairly concluded that 56 feet per month, or about two feet per day of 24 hours, is the highest attainable rate of progress at the eastern end.

At the great Mont Cenis tunnel, with all the advantages of skilled labor, and the economy of prosecuting the work from the open ends, the average rate of advance for some two years, while hand labor only was employed, was 16 inches per day, or 35 lineal feet per month, at each face.

The shaft at the western base of the mountain is the only other point from which, according to present plans, the balance of the tunnel under the mountain proper, for three and a half miles, is to be driven; consequently, the duration of the work is to be measured by the progress between the east end and this shaft. It is impossible to work so rapidly from the bottom of a shaft as from an open entrance. In proof of this, I refer to the experience gained in the construction of several noted tunnels, which, for the purpose of expediting the work,

were, to a great extent, driven by means of shafts. From data furnished by the engineer of the Black Rock Tunnel on the Reading Railroad, it appears that the average advance from the two ends was 40½ lineal feet per month, while from the shafts it averaged but 33 feet per month. From the same source we learn that the progress at the east end of the Pulpit Rock Tunnel, on the same road, was 47 feet per month, while the progress from the shafts averaged 34 feet. Saint Martin's Tunnel, completed in 1857, on the Bourbonnais Railroad in France, was worked from eight shafts, six of which were located at intermediate points on its line, and one at each entrance; the latter being adopted to expedite the work ere yet the approaches to the tunnel had been opened. The mean progress per month of each heading or gallery varied from 31½ feet at shaft No. 2, to 8½ feet at shaft No. 7, the average being but 20 feet per month.

If, therefore, 56 feet per month, or say two feet per day, the progress actually made during the last nine months of operations at the eastern end of the Hoosac Tunnel, be correctly assumed as the future rate of progress at that end, it is evident that 40 feet per month, or say 1½ feet per day, will be found the highest mean rate attainable in the working from the shaft at the west side. This joint progress of 3½ feet per day will require a period of nearly 18 years to complete the tunnel. If, however, it shall be found possible to raise the combined rate of progress to 4 feet per day, of which I can see no probability, the time will be reduced to about 15 years. But, considering the liability to interruption from accident in blasting and removing rock in the darkness, from strikes among the laborers, and the breakage of machinery, it will not be prudent to calculate on a less period than 18 years.

It may be said that hereafter the work is to be done by machinery, and thereby greatly facilitated. As this hope has existed from the earliest inception of the tunnel scheme, and still finds some adherents, I trust that a brief glance at the basis upon which it now rests will not be deemed out of place here.

The earliest notice I remember to have seen of a boring machine, is contained in the following extract, taken from the

Civil Engineer and Architect's Journal of 1847, and headed "Tunneling the Alps":—

"The Moniteur Belgé announces that experiments have been made in order to test the efficacy of a machine just invented for the purpose of effecting a new and speedy method of boring tunnels. It is proposed to apply this machine to the construction of the great tunnel about to be commenced in connection with one of the Italian lines. It was placed in front of the web, and effected a bore to the depth of seven inches in thirty-five minutes. At this rate the new invention will complete upwards of 16½ feet of bore per day; and the proposed tunnel through Mount Cenis will be finished in the space of three years. The experiments have been repeated twice before the first engineers of France, and with the *most complete success.*"

The above and similar announcements seem to have kept alive an enthusiasm and faith on the subject in this country, until the completion and experimental trial of an improved boring machine, in presence of a legislative committee and other gentlemen, at the Hoosac Mountain in 1853. The result of this latter experiment was variously stated at the time, according to the point of view from which it was witnessed; one party claiming the machine to be a perfect success. It is matter of record in the report of the hearing before the committee, that the machine "cut into the rock 4⅛ inches in 15 minutes, or at the rate of 16½ inches per hour." And it was added that "under more favorable conditions it had cut 20 or more inches per hour." Other observers, of a mechanical turn of mind, witnessed no results tending to corroborate such reports, and on the other hand pronounced the experiments a complete demonstration of failure. Whatever may have been the facts, the machine was never afterward put in motion, and until recently, it stood a massive wreck in its old position at the east side of the mountain; the line of approach to the tunnel having been changed to get around it. Some four years later it was again announced, that "a tunneling machine which has cost $25,000 is ready to be put in operation. In some respects it is not precisely what is desired. It may and probably will require some additions or alterations, as is the case with new

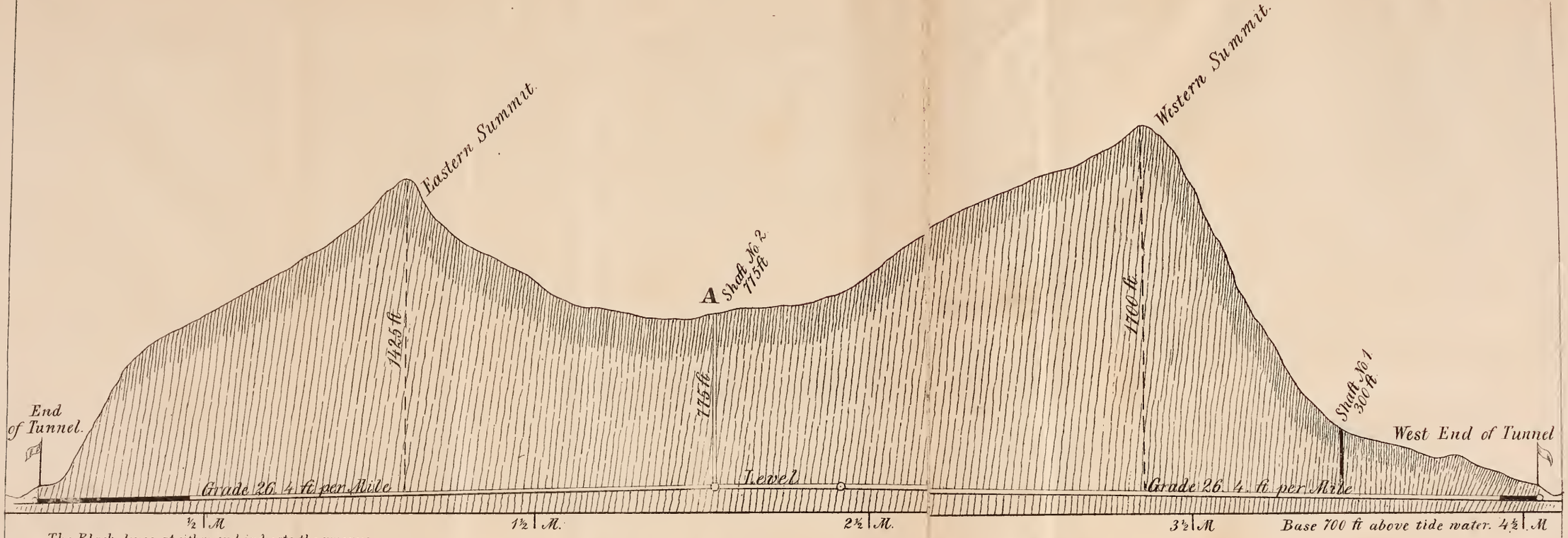
machines generally. That it will do its work, there can be scarcely the shadow of a doubt." *

The machine of 1853 had been designed to cut out, at one operation, a core of 18 feet diameter, while the later invention contemplated the boring of a gallery of the more moderate diameter of 8 feet. After the trial of the latter, in 1859, it was publicly announced "that convincing proof had been afforded to them (the contractors) that the Hoosac tunnel could and would be *perforated by machinery* within a very moderate time, although the experiment was made with a view to test the motion and cutters of the machinery, and not the probable rate of progress. The slowest rate of progress, when in motion with the slowest feed, is about fifteen inches per hour; the fast feed, about two feet per hour. Working only half the time, and with the slowest feed, the tunnel should be *perforated in* 32 *months.*"** But this machine, like its predecessor of 1853, and its Mont Cenis prototype of 1847, has been abandoned and forgotten. Its place in public attention is now occupied by *experimental steam drills*, which are alleged to have been so far perfected several months ago, as to be able to penetrate the hardest granite at the rate of one inch per minute. Among mechanical engineers, however, it is a subject of grave doubt whether machines upon the new plan can be successfully used in drilling any kind of rock. In my judgment, the same features of the Hoosac rock which indicated to practical men the certain failure of the boring machines, render the successful application of any drills, driven by steam or other mechanical force, *wholly impracticable.*

It is true that machinery for drilling has been successfully introduced at Mont Cenis, and it is argued that the same thing may be done at the Hoosac mountain. It seems to me, however, that those who thus reason do not take into account the difference in the structure of the rock encountered at the two localities. "The Mont Cenis rock, on the south side, is soft schist or slate, in horizontal beds; on the north side it is hard schist in horizontal layers, with thin veins of quartz. The Hoosac rock is mica slate, liberally interspersed with

* See printed statement by H. Haupt & Co., sent to members of Legislature in 1858.

** See H. Haupt & Co.'s statement, before referred to.



The Black lines at either end indicate the progress.

PROFILE OF THE HOOSAC MOUNTAIN ON TUNNEL LINE

OF THE

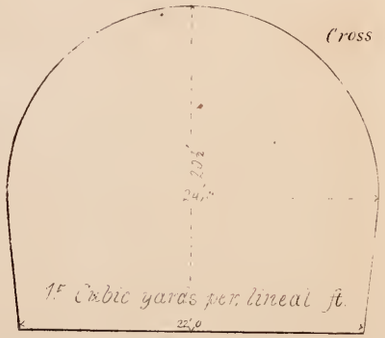
TROY & GREENFIELD RAIL ROAD.

March 1862.

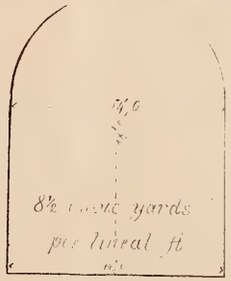
Copied from Profile made by A.F. Edwards Engineer

Lith. by Milton Bradley Springfield, Mass.

Cross Sections of Tunnel.



Tunnel as projected and estimated upon when loan was originally granted



Tunnel as thus far completed.

Horizontal Scale 2000 ft. to an inch.
Vertical „ 600 „ „ „ „
Dip about 5° from Vertical.
Rock-Mica Slate with Quartz Nodules.

regular masses or nodules of quartz. This latter substance is exceedingly difficult to drill. Though in general the masses of quartz are not large, and in drilling by hand may be favored, yet, as their position cannot be foreseen, it is evident that the machine drills, working in fixed and rigid lines, must continually come in contact with them; and, with parts of the areas of drill holes in soft slate and the other parts in a flinty substance, it requires but a little mechanical knowledge to foresee such frequent breakages, as to render drilling machines worse than useless in this peculiar formation. Any rock that is solid and homogeneous, or nearly so, may be drilled by machinery, but an attempt to drill a soft rock, having flinty nodules scattered promiscuously through it, would be attended with much the same results as when, in boring soft wood, a dull augur encounters a hard knot occupying one side of its line of progress.

For the consideration of those who believe in the practicability of applying drilling machinery at the Hoosac mountain, it may be stated that the highest rate of progress yet attained, with the aid of costly machinery, at the Mont Cenis tunnel, is about $3\frac{1}{4}$ feet per day, or 85 feet per month, at each face; and the highest rate of progress anticipated for the future, is only 127 feet per month.* If this latter rate could possibly be attained at both sides of the Hoosac Mountain, the time required to go through would be about nine years.

It has also been suggested to advance the work by sinking a second shaft near the middle of the tunnel. This suggestion was considered and rejected by the company's engineer at the time of making his original estimate of cost.

The shaft was to have been located at the point A, on the accompanying profile of the mountain. (*See Plate.*) It was to be eliptical in form, with 15 and 30 feet diameters, 775 feet deep, and its cost was estimated at $132,536. Such a shaft is admitted by most engineers to be absolutely indispensable for the proper ventilation of the tunnel when completed, and the probable expense of sinking it should therefore be included in estimates of cost; but, taking into consideration the time required

*See London Mechanic's Magazine, September 1861.

to construct it, and the progress which will be attainable in driving galleries from its base, the time and interest charges thereby saved, in completing the tunnel, would not be so great as might at first be supposed.

The sinking of the shafts of the Saint Martin's Tunnel, in France, averaging only 120 feet deep, with every facility attainable, could only be effected at the rate of about 17 feet per month. The shafts of Pulpit Rock and Black Rock Tunnels on the Reading railroad, varying from 70 to 120 feet in depth, were only sunk at the rate of 19½ feet per month. The sinking of the shaft at the western base of Hoosac Mountain is believed to have occupied some twenty-one months; if so, the rate of progress could only have been 16 feet per month. Of course the difficulties increase with the depth, and six inches per day, or 13 feet per month, is the largest mean progress that could be expected in a shaft of 775 feet in depth. This rate would require about five years for the accomplishment of the proposed central shaft.

If now we assume that after five years it will be possible to commence tunneling at the bottom of a central shaft, and thereafter to progress at the rate of 2 feet per day, while the work goes on at the other points at the rates before supposed, it will be found that the time required to complete the tunnel would be thereby reduced from 18 to 12½ years.

3rd. There remains the question,—*How much will it cost to complete and put in running order the other portions of the Troy and Greenfield Rail Road?*

The proper answer to this question depends upon which of three classes of roads be adopted as a basis of calculation.

First. For a properly located, well built and substantial railroad between the eastern terminus and Hoosac Mountain, the entire cost of the four items of graduation, masonry, bridges and superstructure, would be not less than $30,000 per mile,—say $900,000.

Second. If it had been originally determined to construct a medium class railroad on the contractor's location, with its numerous abrupt curves and high grades, the total cost of the same four items would have amounted to about $700,000—the sum set apart by the several loan acts, to be advanced on that part of the road.

Third. To accomplish the same work on a railroad of the *character* and on the location actually adopted, I should roughly estimate the cost at $550,000 to $600,000.

I will assume that the road is to be completed upon the plan hitherto followed, with the exception that the bridges are to be in some way made capable of *holding up and safely passing trains at a moderate velocity*, and call the entire cost, of graduation, masonry, bridging and superstructure, $600,000

From an examination of the estimate made by the State engineer, on the first of July, 1861, of the quantities of all work done up to that date, and a careful inspection of the line, I conclude that the contractors have, for all purposes connected with the construction of this part of the road already expended or become obligated for, the sum of $410,000 00

Leaving to be expended for the completion of the roadway on the 30 miles east of the mountain, $190,000 00
Add for land damages and fencing, 42,000 00
Station buildings, turn-tables, &c., 45,000 00

Total, $277,000 00

With this further amount of expenditure, and for nothing less, I am of the opinion that trains might be run from Greenfield to the Hoosac Mountain. A road of the same character from the west end of the tunnel to North Adams—1 3-4 miles—would cost a further sum of $40,000, making a total of $317,000, now required for putting in running order without equipment, that part of the Troy and Greenfield Railroad between Greenfield and North Adams, exclusive of the Hoosac tunnel.

While I have, for the purposes of an estimate, assumed above that the Troy and Greenfield Railroad, when completed, is to be completed on the present location and grades, I beg not to be understood as recommending such a proceeding. Whenever built, this road should be equal in character to the Vermont and Massachusetts Railroad; for, if the Hoosac tunnel ever be completed, the Troy and Greenfield Railroad will form a link in a great and important thoroughfare. A poorly built road on a good location may subsequently be improved and perfected;

a well built road on a poor location can only be remedied by a general *re-location* and *re-construction.*

I repeat that my estimate for completing the road is based upon the existing location. This location has grades of 50 and 58 feet per mile, while the company's engineer, after a careful survey, had formerly adopted none higher than 31 feet per mile; and in a distance of 30 miles, between the eastern terminus and the mountain, the line is lengthened one mile, and it contains 4005 degrees of curvature, of which 2806 degrees are turned upon radii, varying from 955 to 716 feet. If the line were no more crooked than the Vermont and Massachusetts Road, it would have but 1560 degrees of curvature in this distance. The Western Railroad, over its most difficult section, from a point near Westfield to the Washington summit, 30 miles, contains but 2586 degrees of curvature, the shortest radius being 1042 feet, against the 4005 degrees of curvature and shortest radius of 716 feet on a corresponding section of the Troy and Greenfield Railroad.

That this subject of allignment may be fully understood, I present a table showing the lengths, degrees, and amounts of curvature on the original and present locations, and also on a corresponding section of the Western Railroad. I have also prepared the accompanying diagram to illustrate the same subject.*

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*A copy of this diagram or map is deposited at the Senate Chamber.

Comparative Table of Alignments on the Western Railroad from Washington Summit to Westfield, 30 miles; and on the Troy and Greenfield Railroad, between Hoosac Mountain and Greenfield, by Engineer's location, 29 miles; and between same points, by Contractor's location, 30 miles.

Description of Lines.		Location of W. R. R. over its most crooked section.			Location of Troy and Greenfield R. R. by Contractors.			Location of Troy and Greenfield R. R., made by Co's Engineer.		
Kind of Curve.	Radius in feet.	Length in Miles.	No. of Curv's	Am't of Curvature.	Length in Miles.	No. of Curves.	Am't of Curvature.	Length in Miles.	No. of Curves.	Am't of Curvature.
Under 1°	5,730	1.65	4	61°				.78	4	25°
" 2°	2,865	7.08	23	485°				4.79	21	309°
" 3°	1,910	5.05	20	584°	.63	6	68°	3.80	21	424°
of 3°	1,910	1.16	6	183°	1.41	16	222°	2.71	13	429°
Betw'n 3° & 4°		1.39	4	254°						
of 4°	1,432	1.20	5	255°	3.36	34	709°	3.59	13	760°
Betw'n 4° & 5°		1.91	5	430°				.56	2	133°
of 5°	1,146	.58	3	152°	.75	8	200°	.21	1	56°
" $5\frac{1}{2}$°	1,042	.60	2	182°						
" 6°	955				7.32	69	2,318°	.19	1	60°
" 7°	818				.39	3	144°			
" 8°	716				.81	6	344°			
Straight.		9.42			15.44			12.50		
		30.04	72	2586°	30.11	142	4,005°	29.13	76	2,196°
The Curvature of the Vt. and Mass. R. R. averages 52° per mile. Shortest Radius 924 feet.		Average, 86° per mile. Shortest Radius, 1,042 feet.			Average, 133° per mile. Shortest Radius, 716 feet.			Average, 75° per mile. Shortest Radius, 955 feet.		

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A knowledge of the facts thus developed may suggest the expediency of a thorough field examination of the grades and allignment of the road, prior to the expenditure of any more money towards its completion. The result of such an examination by competent engineers, having in view the safe and economical operation of the road, might, and probably would be the entire abandonment of the present location. This, if found advisable, would involve a severe loss; but the two or three hundred thousand dollars, thus parted with, is a small matter, compared with the lasting disadvantages of having a section of road, badly laid out and badly constructed, in the middle of a great line of communication between Boston and the Hudson River. If this contemplated loss is to be realized, the occasion for it already exists; its magnitude can never be less, nor can it be too soon ascertained. If there be no reason to anticipate it, then a careful survey and report, before the work is resumed, will tend to allay the general distrust. Whatever of fault shall be found to exist is due primarily to the neglect of proper safeguards in the legislation of former years; and it should now be regarded as a fortunate circumstance that, before our losses have attained gigantic proportions, a fitting occasion is presented for reviewing what has been done under the imperfect arrangements of the past, and determining how far the money already loaned, has been expended in good faith by the Troy and Greenfield Railroad Company, in producing a security of any value to the Commonwealth.

Respectfully submitted,

D. L. HARRIS.

NOTE.

It has been suggested that while, in the foregoing communication, I have set down various items of expenditure on the railroad and tunnel, the probable aggregate amount expended by the present contractors, and the amount received by them, are nowhere given. I proceed to supply these deficiencies as follows :—

Estimated expenditure and liabilities incurred in working thus far the eastern division of the road from Greenfield to the Tunnel (see page 19),		$410,000
The Railroad Company, in their petition to the Legislature, in January, 1856, state that the gradation and masonry on that part of the road between North Adams and Williamstown are so far advanced "that a further outlay of $10,000 will prepare the same for the superstructure." This superstructure would cost some $45,000. To cover all contingencies, call the expenditures made on this section of the road, at the charge of the present contractors,		100,000
The actual cost of the Southern Vermont section of the road did not exceed		90,000
Estimated amount expended in excavating and propping up the Tunnel (see page 8),	$141,250	
Probable cost of the approaches and shaft of ditto,	27,000—	168,250
Total,		$768,250

Against these expenditures the Commonwealth has advanced scrip as follows :—

On the eastern division,	$505,000	
On the North Adams and Williamstown section, say one-half of the first installment paid on road and tunnel,	50,000	
On the Southern Vermont section of six miles,	200,000	
On the tunnel, about	170,389—	$925,389
Balance,		$157,139
And the towns along the line have paid		125,500
Making total receipts beyond the estimated cost of work done,		$282,639

It should be observed that this estimate embraces only the legitimate expenditures by the contractors towards building the railroad and tunnel. It excludes such items as the payment of interest on the State loan; interest and shave money "from twelve to twenty-four per cent." paid for temporary loans; the alleged expenditure of $25,000 in 1857 for a worthless boring machine and the subsequent cost of useless experimenting with steam drills; the alleged payment of old indebtedness of the Railroad Company, to an amount variously stated at from $30,000 to $40,000, to enable the contractors to get and retain possession of the road; and finally the payment, by contract, "into the hands of the Treasurer of the Troy and Greenfield Railroad Company, annually, the sum of not less than $500 to defray the necessary expenses of organization and printing." It *may* be that such like charges have absorbed all the surplus received from the State and from town subscriptions and left a deficiency, as claimed by the contractors, of $361,380. At all events it will be well to profit by the official hint recently given out, "that no expectations of future progress can be entertained, based upon the financial credit or pecuniary resources of the contractors of the Hoosac Tunnel."

D. L. H.

March 22, 1862.

C 41

DEATH OF OUR MINOTAUR.

BY

THESEUS.

"WHO KILLED COCK-ROBIN?
I, SAID THE SPARROW,
WITH MY LITTLE ARROW,
I KILLED COCK-ROBIN."

PRINTED, NOT PUBLISHED.

BOSTON, 1868.

HOOSAC TUNNEL.

THE gory locks of the Hoosac Tunnel have given Frank Bird, the Walpole dyspeptic, another turn, and he pours out fifty-three pages of Pecksniffian lamentations and abuse, drawn from the never-failing fountain of spleen and remorse which constantly engulphs his guilty mind.

The present generation of legislators, will undoubtedly find amusement in some portions of "THE MODERN MINOTAUR," but those more familiar with the acts, course, and tunnel character of this Walpole aspirant for notoriety, find no use for the document. Its amiable predecessors, filled with the gentle breathings of the sweet spirit of the Walpoleon paper-maker and pamphleteer, were yearly broadcast on the legislative ocean without causing a ripple on its waters, or changing a vote among its members. Long practice, or failing powers for misstatement, have increased the ability shown in his congenial employment, as well as trebled his power in the Legislature. His two pamphlets, in opposition to the Cape Cod improvement, and one special hearing before the committee, at which he not only gratified the committee by his personal presence, (so unusual around the lobbies of the state house) but employed a counsel, — secured in the House of Representatives no less than three votes in opposition to that measure, and this, too, after a trip to the Cape, in company with a large number of the members. The brilliant result of the Cape Cod campaign, emboldens our modern Don Q—— to a renewed attack on the old Boar, whose tusks he has felt so often.

Like Henry Ward Beecher's little dog Noble, when wanting employment, he always returns to that hole to bark and scratch,

thus furnishing exercise for his Billingsgate invective, and employment in scattering mud over those interfering with, or exposing his designs, as well as over his subject.

Vol. I. of his Tunnel pamphlets for 1868, is most appropriately named. Who is "The Modern Minotaur" in Massachusetts, for whose idiosyncracies she has been, and still is, pouring out her treasure? Frank Bird, principal, or Frank Bird, agent? The bloody instructions he taught return to plague the inventor. His own pamphlets furnish the best evidence of his criminal course, and the falseness and folly of his charges. This last production is a sequel to its predecessors. This, however, is not the first time a conspirator has turned state's evidence on his comrades.

He now not only testifies, but puts it in print at his own or some other person's expense, that the years he labored in company with his Sancho Panza from the Connecticut River to vilify, blacken and destroy the reputation, and break down the financial credit of Haupt & Co., who were the contractors for the completion of the Hoosac Tunnel, were worse than wasted, because, instead of stopping the work he only undermined existing plans, substituted others, and plunged the state into the large and totally useless expenditures, which he now holds up to the Legislature as an exhibition of the folly, not of himself and his ring but of those who have simply followed the plans which he alone is responsible for.

With the malice of a fiend, he haunted the State House from the coal hole to the dome, prostituting every faculty to the accomplishment of his scheme, which was the ruin of Haupt & Co., and stopping the work on the road and tunnel.

He succeeded, then as now, in getting committees of investigation appointed; then, as now, he appeared before them with his wretched complaints and falsehoods aided by counsel; long hearings at great public cost were had year by year, while the Legislature was in session, and during the recess. The services of Ex-Gov. Boutwell, as his counsel, were called into play, to endeavor to give some character to his side of the case.

Political influence in his little way, champagne dinner influence on Saturday afternoons, whiskey and cigar influence freely shared, for all of which his patriotic pocket or some body corporate paid, were all brought to bear, backed by pages of pamphlets, circulars, letters, newspaper articles, all written with the desperate charcoal of his splenetic malice. In spite of all these things, to the honor of Massachusetts' Legislatures, not one man could be found in all those years mean enough to wear Bird's livery, or vile enough to let the plain evidence of facts be overthrown by the sounding brass of the malignant vilifier. Every committee returned unanimous reports in favor of Haupt & Co., and show all these Walpolean attacks and charges were as baseless as the insane visions of an unfortunate lunatic. Haupt & Co. continued the work, endorsed by each successive Legislature, each investigating committee, each Governor and council, and opposed by none save Don & Sancho, and their seven by nine organ, the "Springfield Republican," until the last half of the first year of the administration of Governor Andrew.

During the administration of Gov. Banks, Bird was obliged to confine his lobbying operations to other sections of the State House than the Council Chamber; the west wing was relieved of the pestilential "shyster." Mr. Andrew, then an aspirant for the Governorship, was often bored by his presence, and with his usual good-nature, listened to his figures, and complaints of the extravagance and vast expenditure of Haupt & Co. at the Tunnel. Uninformed as to the real facts, and believing Bird a simple-minded but active person, the head of a party which in 1857 had thrown two hundred and fifty votes in opposition to Gov. Banks' first election, Mr. Andrew conceived a prejudice against the Tunnel enterprise, and especially against the contractors Haupt & Co. The result of the long and thorough investigation of the special committee of the House of Representatives of 1860, was the passage of a new loan act, "which, giving timely aid when required, surrounded the work with ample guarantees and would have insured the completion of the

whole without exceeding the limits of the original $2,000,000 loan." The Bonds and Stock of the Troy and Greenfield Railroad Company, and loans from cities and towns, would have furnished the two million dollars more, which would have been all the means required to finish the work on the basis it was then being carried forward, which was for a single track tunnel, with no central shaft. The interest represented by Frank Bird knew this: it was the very thing they proposed should not be done; the completion of the tunnel at a reasonable cost was their defeat. Having totally failed in all their assaults through the Legislatures from year to year, for the more the subject was investigated the more firmly all were convinced of its importance to Boston and the Commonwealth, these disinterested patriots, through their Walpole tool, commenced a new system of tactics.

Under the loan Act of 1860, Col. Ezra Lincoln, now deceased, an engineer and a gentleman well known through the State, was appointed state engineer; among his other duties, he was required to make an estimate of the work done by the contractors, before they could receive the amount due them, which was also approved as due them, by the Governor and Council.

Early in the fall of 1860, the contractors called on the State Engineer for an estimate; he was confined to his residence by severe illness; after months of waiting, Messrs. Haupt & Co. urged Gov. Banks to accept Mr. Lincoln's resignation as Engineer, and to appoint another; in the month of December, the Governor appointed Mr. C. L. Stevenson, in place of Mr. Lincoln. Mr. Stevenson had been Mr. Lincoln's assistant engineer, and was perfectly familiar with his plans and with the work. The estimates were made and approved, and the money due the contractors was drawn from the Treasury, but a few days before Mr. Andrew was inaugurated as Governor. Bird and his piratical crew could not fail to improve so favorable an opportunity for slander, as was offered in the fact that this appointment was made, and this money paid so near the close of Mr. Banks' administration. Every appliance was

brought to bear on Gov. Andrew's mind to increase his prejudice against the work and the contractors; until at last, in the spring of 1861, he surrendered himself to the serpent's embrace, and removed the state engineer, and appointed one satisfactory to Bird and his interest.

"Eat," breathed the fiend, beneath his serpent's guise:
"Ye shall know all things; gather, and be wise."

The basis on which the work had been prosecuted, under instructions from Mr. Lincoln, the State Engineer, was changed; under those of Mr. Whitwell, the new appointee, such conditions were imposed as to render it impossible for Haupt & Co. to comply with them; the result, as expected by the inspirers of the new policy, was, that when the contractors called for their next payment, the new engineer declined to approve their account, and His Excellency declined to pay them, and the work on the Tunnel and Road ceased, and Haupt & Co. were compelled to stop the work.

The deed was done, and well done, and done quickly, after the accession of Gov. Andrew, under the malign influence which haunted him; it was a deed he lived to bitterly regret, as he would to-day testify were he living.

Frank Bird did it; "the modern Minotaur" did it; he got inside the cavern, and ever since sacrifices have been offered to his insatiate maw, yet

"The immortal hunger lasts, the immortal food remains."

Let us see how much has been sacrificed by following the advice of "the Minotaur." The friends of the Tunnel asked no change in the work; they were satisfied with the progress being made by Haupt & Co., and with a single track tunnel, but Bird & Co. saw two ways of killing the tunnel; one was, to stop it altogether, another was to increase its dimensions, sink a central shaft, employ a high-priced State Commission, that he could manipulate through political combinations, and increase the expense on the work to such figures as to alarm the prudent.

Having failed to stop the work entirely, he turned to the next alternative. He felt competent for any exploit. He evidently has mistaken his calling; one would suppose him a natural engineer, his tastes seem so to run in that direction. At the period of stopping the work in 1861, he certainly thought himself a modern Amphion; for,

> "Amphion too, as story goes, could call
> Obedient stones to make the Theban wall.
> He led them as he pleased; the rocks obey'd,
> And danced in order to the tunes he play'd."

The tune has cost the State of Massachusetts $2,800,000.

Work Done on Tunnel by Haupt & Co., and Cost.

Haupt & Co. excavated both approaches to the Hoosac Tunnel, sunk the west shaft to grade 325 feet, provided hoisting and pumping machinery and buildings, without any pay therefor. The State only paid for actual progress in the tunnel at the rate of $30 per lineal foot for heading, and $ 20 per lineal foot for enlargement, equivalent to $ 50 per lineal foot for full sized tunnel of about ten cubic yards per lineal foot, or $ 1,250,000 for the whole tunnel. The progress made in tunnelling was —

3,060 lineal ft. of heading, $30,	(9,517 cubic yds.,)	$91,800 00
2,130 lineal ft. of enlargement at east end, $20,	(13,249 cubic yds.,)	42,600 00
610 lineal ft. of enlargement west end, $20,	(6,100 cubic yds.,)	12,200 00
	28,866 cubic yds.	
Other outside work, approaches, shaft, machinery, buildings, &c., ...		00,000 00
Whole amount paid Haupt & Co. on tunnel,		$146,600 00

Cost of Work done by the State.

Whole amount appropriated,	$4,300,000 00

Deduct advances to Haupt & Co.		
on road and tunnel,	$725,388 00	
Expended by State on road,	371,296 00	
Labor and service on road, by		
Act of 1862,	175,000 00	
		1,271,684 00
Expended by State on tunnel, includ'g int.,		$3,028,316 00

Haupt & Co.'s work cost per cubic yard, including interest, $5.08. The work done by the State cost per cubic yard, including interest, $92.50.

The State never paid a dollar of interest while the work was in the hands of Haupt & Co.

The State has paid every dollar of interest since the work has been taken out of the hands of Haupt & Co.

Total amount of tunnel completed by the State.

Cubic yards,	42,936

Cost the State.

As above,	$3,028,316
Cost if Haupt & Co. had been let alone,	218,114
Balance due from Bird & Co.,	$2,810,202

Thus we see that our modern minotaur, Mr. Frank Bird, has already cost the State by his ignorant interference, and persistent lobbying, nearly a million dollars more than the total sum originally appropriated, which was two million dollars, a sum deemed amply sufficient under the plans proposed and adopted, with the aid from cities and towns, and the stock and bonds of the Troy and Greenfield Railroad corporation.

Submission to the insolent exactions of this shameless intermeddler has led to these results; we should be warned by the past, of the impolicy of following advice from such a source for the future; experience though sometimes a bitter, is a thorough teacher. We have the light of experience now at least, and let us walk by it. Avoid the advice of the enemy, nor again let him plunge the State into disgrace and folly,

either to gratify malice, or to enrich the anti-tunnel lobby. To Bird and his ring is the State alone indebted for the sacrifice of nearly three million dollars of useless expenditure.

Let them deny it if they will, the facts are laid bare and cannot be refuted. Let them proclaim the fact that they opposed the Brooks commission, even with as much bitterness as they did Haupt & Co., until at last the health of Mr. Brooks broke down, and he was obliged to yield to the unjust and wicked pressure brought on his faculties, — what if they do? Does that avail to blot out the facts? *Had not Bird and his ring, interfered with the Tunnel, it to-day would have been approaching completion, at a cost of only two million dollars to the State.* "Let the galled jade wince," under the lash of truth. There are the figures which do not lie, there is the whole case. Let him write pamphlets until they are as numerous as formerly in the days of the coalition between the Democratic and Free Soil parties, his circulars were on political wire-pulling, and they were so numerous that he was known through the State as "circular Bird," — and yet the truth of history cannot be changed. That we are to have more pamphlets and circulars from him yet we doubt not; we have had but three this winter, and that is but a homœopathic dose for him to administer to one legislature. More will come, it is the nature of our minotaur.

> "Half froth, half venom, he spits himself abroad,
> In puns, or politics, or tales, or lies,
> Or spite, or smut, or rhymes, or blasphemies."

We select a paragraph from his Vol. I. for 1868, page 39.

"I know" — he says — "and no man is prouder of it" (proud as a cock turkey no doubt)— "how gladly this people pay taxes for all good purposes;" (yes, they like to pay taxes, muchly,) "but as I follow these appropriations, as they are distributed to every hamlet, and every household, and know that to large masses of people they involve self-denial and suffering," (gentle Pecksniff!) "I cannot help denouncing the men who demand these appropriations, for selfish and sectional purposes alone, as oppressors and robbers of the people." Who these

" oppressors and robbers " are we need not specify, for none but Bird and his ring ever demanded these large appropriations, and we have shown what the demand has already cost the self-denying and suffering masses of the people who pay the taxes. At the end of his Vol. I. on the Tunnel for 1868, Bird has furnished a table to show what is the tax on $1,000,000 for each town and city in the State. As it is only by assumption we ever believe correct anything coming from such a source, we will assume his table to be so, and the result is that multiplying his figures by three, each town and city in the State can see just how much our modern minotaur has cost them already, and thus we find he has cost Boston, $1,116,490,00

Walpole,	3,660,00
Worcester,	61,290,00

" Full oft we see,
Cold wisdom waiting on superfluous folly,"

but we doubt if another similar instance can be found where a State has been turned from a wise policy in the prosecution of a grand and beneficent enterprise, for the material benefit of all her people, into such a course of folly by the influence and exertions of one or two persistent intermeddlers, without one redeeming quality to recommend them, or a particle of foundation for their original charges and innuendoes.

Advice to Young Members.

If there are any of the younger members of the Legislature who enjoy the hospitalities of Bird at Parker's or Young's, and who are being inveigled into opposition to this vital enterprise, we would warn them to beware !

In 1862 the late Hon. William D. Swan of Dorchester was a member of the Senate, and made the acquaintance of the convivial Bird. Mr. Swan was a man of education and culture, formerly a school-teacher in Boston, and author of several standard school books.

He made a lengthy speech against the Tunnel, and afterwards, to his utter astonishment, Frank Bird announced to the

public that he wrote Mr. Swan's speech, yet this same Bird innocently comes to you in his pamphlet, and prates of "public and private virtue," and warns you of "shameless shysters." Of course no one believed Bird wrote Mr. Swan's speech, and, therefore, it was a work of supererogation for Mr. Swan to publicly deny that he did so, as he did. If Bird wrote it, the greater the shame to Bird for publishing the fact. Therefore, young Legislators, beware of Bird or he will claim your speeches as well as votes. When engaged in lobbying on the tunnel he furnishes dinners freely, circulars and pamphlets freely, and we presume he could get up speeches freely, also, if he can find any satisfied with his prosaic dullness; he is flush with all these,

"And wanting nothing but an honest heart."

Bird's Political Virtue.

Turning from this exhibition of private honor, we will offer a brief review of Bird's public virtue, as exhibited in certain of his prominent political acts. His grief over the fact that in 1861 several towns in Franklin and Berkshire counties largely deserted Gov. Andrew, when they found him so completely under Bird's influence in Tunnel matters, is truly distressing, when we read his account of the defection, we were reminded of the butcher's son, in Dr. Holmes' poem of the spectre pig,

"When with his pocket handkerchief,
He wiped his little eyes."

His grief however is soon turned into indignation, and he "asserts, without fear of contradiction, that history has no page so black as that." Cheer up lachrymose mourner, we will turn to several pages in your own history, and hold you up to "the gaze of wondering men," so that all may recognize your deformity.

"The fish called a flounder, perhaps you may know,
Has one side for use, and another for show;
One side for the public, a delicate brown,
And one that is white, *which he always keeps down.*"

So with our Minotaur, if he has a white side he always keeps it down.

In the year 1857, a convention was called to meet at the city of Worcester "to consider the practicability, probability and expediency of a separation between the free and slave states, and to take such other measures as the condition of the times may require." The President of this convention was F. W. Bird, better known as Frank Bird, our modern minotaur, this same immaculate patriot who is so lachrymose over the "political profligacy" of those friends of the Tunnel, who would not support Gov. Andrew and Bird's tunnel policy. He not only made a long speech, but he made two speeches in favor of the object of the convention. In his first speech he said, "It seems to me that no sane or sensible man, who looks upon this matter apart from any political aspirations, can make himself believe that this union is of any value to anybody in the free states."

He also said, "General Wilson converts the whole republican party into hangmen, in the following extract from his speech in the Senate: 'In the public press, and before the people everywhere, the doctrine was maintained that we were for the Union; and if any man, North or South, laid his hands upon it they should die, if we had the power, traitors' deaths, and leave traitors' names in the history of the Republic.'" *

The name of the Hon. Charles Francis Adams had been used as a delegate, but Mr. Adams promptly sent a letter, stating he had no sympathy with such a convention.

This shows the estimation of Bird and his convention in the mind of General Wilson, and the following, one of their reso-

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* This disunion convention was everywhere denounced, not only by our public men, but by the press of our own and other States. The Providence Journal, then edited by Mr. Anthony, now a U. S. Senator, said, that disunion was "neither practicable, probable, or expedient. It cannot be done, and it ought not to be done; and those who try to do it only add treason to folly, reducing themselves to the level of the nullifiers of the South, and unlike them, wanting the sympathy of any considerable portion of their own section of the country."

lutions, shows on which side these men would have stood had they lived south instead of north of Mason & Dixon's line.

"*Resolved*, That henceforward, instead of regarding it as an objection to any system of policy, that it will lead to the separation of the States, *we will proclaim that to be the highest of all recommendations, and the greatest proof of statesmanship;* and we will support, politically or otherwise, such men and measures *as appear to tend most to this result.*"

Bird says that, in 1861, "Every manly heart in the State was moved to aid Governor Andrew, in sustaining the National cause. In such an hour, at an election when Massachusetts had a right to expect that every *loyal* man would do his duty, through his whole section the cry of UNION *and* liberty was drowned by the discordant notes, 'Tunnel! Tunnel!'"

A war had broken out between two sections of the Union for its destruction and the annihilation of the Constitution of the United States; the priceless blessings conferred upon us by the Union under the Constitution were in danger, blood had been freely shed in their defence, no questions were asked, whether the patriot soldier was a Republican or a Democrat, but only "are you for the Union and the Constitution?" In defence of these they laid down their lives. Where was the President of the Disunion Convention of 1857 then? Let history answer.

In the year 1862, this same Frank Bird was, by some means, elected to the Governor's council. Why he was put there we never yet have been able to discover; the party must have been very short of candidate timber, but he was there, and when his Excellency Gov. Andrew and his council elect appeared to be sworn into office, this Mr. Frank Bird, *declines to take the oath to support the Constitution of the United States.*

The brave "boys in blue" were laying down their lives on that very day in its defence and support, but a man elected to be an adviser and councillor of Governor Andrew declined to take an oath to support it. Surely that council chamber was no place for him. In former years we could respect an *honest* abolitionist, who resigned the prizes of ambition to principle, and who consistently looked upon political affairs, "*apart from*

political aspirations," but a janus-faced demagogue, who fawned on any who would serve to make him thrive, we always despised. For several days this Bird kept the legislature awaiting his decision, until at last the Hon. Tappan Wentworth of Lowell, then temporarily in the chair of the Senate, at the request of the President of the Senate notified Bird that there would be a vacancy in his councillor district if he did not comply with the Constitution of the United States and take the oath.

The love of office of course predominated over principle, and Bird presented himself, and swore to support the Constitution of the United States.*

This was only one of the trials and indignities put upon Governor Andrew by this our minotaur. While in the council (where he managed to get on a committee of two to sell government bonds, etc.), he could not command position among the patriotic men with whom the Governor associated, he was too well known to be respected. In the trying position Governor Andrew was placed, it was necessary for him to conciliate the uncomfortable member so far as possible, and knowing Bird's weakness for a good dinner, he proposed his name for membership to the Union Club of which the Governor was then President. Judge of his Excellency's feelings when the ballot box disclosed that, of 169 *votes thrown*, 145 *were black balls*.

Such a vote we venture to assert "without fear of contradiction," never before was known in the history of any club in the civilized world.

We have shown his position in 1857, that it was not changed in 1862, and the estimation in which he was held by the Union

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* The following lines were circulated in the State House at the time.

"There was an old Gander in Walpole,
Who attempted to sit on a tall-pole:
Which was very absurd
In this silly old Bird,
This fussy old Gander of Walpole.

"For while he sat there,
All tranquil you'd swear,

Not dreaming of harm on his tall-pole,
With a spring like a trap,
Came savage old Tap,
And down came the Gander of Walpole."

men of Boston, in the years of the war. He now says he was not elected a delegate to the Chicago Convention by the aid of the friends of the Tunnel; we trust this is true, for the honor of the State. Gen. Grant must feel great satisfaction in the support of a man with such a record. But we trust he will not make him his model of "public and private virtue."

Vol. I. of the Tunnel pamphlets for 1868 commences as follows: "Once a year a ship, laden with the richest jewels of her people, left the port of the ancient Athens."

Without stopping to criticise the grammar, we will state that, according to both Plutarch and Ovid, the ship left Athens every ninth year, and according to Diodorus Siculus, and Apollodorus every seventh year; we are willing to compromise with those ancient and distinguished authorities, and call it every eighth year. In 1861 we sacrificed to our modern Minotaur, and the eighth year will come in 1869. He calls for another sacrifice. He demands the stoppage of the work, that the machinery, buildings, dwellings, workshops, water-wheels, dams, and storehouses, shall go to decay; that the interest on the $4,300,000 expended, shall accumulate, so that when the work is again renewed there shall be as much useless expenditure as possible. Shall the sacrifice to the Minotaur be made? We trust the first, the second, and the third houses will say emphatically No.

We had no intention of discussing the "practicability, possibility, or expediency" of the Tunnel enterprise. The messages of our Governors, the reports of our legislators, the obvious and plain dictates of common sense, the demands of our failing commercial interests, all commend the enterprise, and demand its completion; our object simply has been to show that,

"We, too, have a Minotaur — a double-faced monster, born of unholy lust, and devourer of precious treasure." If that task is accomplished, Theseus' work is done.